MICROSCAN

MS-3 Laser Scanner User Manual

P/N 84-000003 Rev B

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For technical support, e-mail: **helpdesk@microscan.com**.

Warranty

For current warranty information, see: **www.microscan.com/warranty**.

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Table of Contents

Chapter 1 Quick Start
- Step 1 Check Hardware 1-2
- Step 2 Connect the System 1-3
- Step 3 Position Symbol and Scanner 1-4
- Step 4 Install ESP 1-5
- Step 5 Select Scanner Model 1-6
- Step 6 Autoconnect 1-7
- Step 7 Test for Read Rate 1-8
- Step 8 Calibrate the Scanner 1-9
- Step 9 Save Calibration Settings for Power-On 1-10
- Step 10 Configure the Scanner 1-11

Chapter 2 Using ESP
- Setup Mode 2-2
- Application Mode 2-3
- Dropdown Menus 2-4
- Connect Menu 2-9
- View 2-11
- Navigating in ESP 2-12
- Send/Receive Options 2-13

Chapter 3 Communications
- Communications by ESP 3-2
- Communications by Serial Command 3-2
- Password Protection 3-3
- RS-232/422 Host Port 3-4
- RS-232 Auxiliary Port 3-11
- Preamble 3-20
- Postamble 3-21
- LRC Status 3-22
- Intercharacter Delay 3-22

Chapter 4 Read Cycle
- Read Cycle by ESP 4-2
- Read Cycle by Serial Command 4-2
- Multisymbol 4-3
- Number of Symbols 4-4
- Serial Trigger 4-12
- End of Read Cycle 4-14
- Decodes Before Output 4-16
- Scanner Setup 4-17
- Laser Setup 4-21

Chapter 5 Symbologies
- Symbologies by ESP 5-2
- Symbologies by Serial Command 5-2

Code 39 5-3
Code 128 5-6
Interleaved 2 of 5 5-10
Codabar 5-13
UPC/EAN 5-16
Code 93 5-19
Pharmacode 5-20
Narrow Margins 5-22
Symbology ID 5-23
Background Color 5-24
Autodiscriminate 5-24
Symbol Ratio Mode 5-25

Chapter 6 I/O Parameters

Output Conditions by ESP Menu 6-2
I/O Parameters by Serial Command 6-3
Symbol Data Output 6-4
Message Output 6-7
No Read Message 6-8
Bad Symbol Message 6-9
No Symbol Message 6-10
Beeper 6-11
Partial Output 6-12
Serial Verification 6-13
EZ Button 6-15
Output 1 6-18
Output 2 6-24
Output 3 6-25
Quality Output 6-26

Chapter 7 Matchcode

Matchcode by ESP 7-2
Matchcode by Serial Command 7-2
Overview of Matchcode 7-3
Using Master Symbols 7-3
Matchcode Type 7-4
New Master Pin 7-9
Master Symbol Database 7-10

Chapter 8 Diagnostics

Diagnostics by ESP 8-2
Diagnostics by Serial Command 8-2
Diagnostic Messages Overview 8-3
Counts 8-4
Hours Since Last Reset 8-6
Laser High 8-7
Laser Low 8-8

Service Message 8-9

Chapter 9 Calibration

Calibration 9-2
Auto Frame 9-6

Chapter 10 Terminal

Terminal Window 10-2
Find Function 10-3
Macros 10-4
Terminal Window Functions 10-5

Chapter 11 Utilities

Utilities by ESP 11-2
Summary of Utilities Commands 11-3
Read Rate 11-5
Counters 11-6
Master Database 11-8
Digital Bar Code 11-11
Firmware 11-12
Device Control 11-13
Symbol Type 11-15
Defaulting/Saving/Resetting 11-16
Microscan Grading 11-17
Reader Status Requests 11-19

Appendices

Appendix A General Specifications A-2
Appendix B Electrical Specifications A-5
Appendix C Serial Configuration Commands A-6
Appendix D Serial Command Format A-9
Appendix E ASCII Table A-11
Appendix F Defaulting/Saving/Resetting A-13
Appendix G Symbol Configuration A-15
Appendix H Object Detector A-17
Appendix I Formulas for Number of Decodes A-18
Appendix J Operational Tips A-21
Appendix K Interface Standards A-22
Appendix L Multidrop Communications A-23
Appendix M Troubleshooting A-28
Appendix N Glossary of Terms A-30

About the MS-3 Laser Scanner

The MS-3 is an ultra-compact scanner that can decode high density symbols from 2 to 10 inches at a 70 degree scan angle, at speeds of 300 to 1,000 decodes per second, with a power draw of only 300mA at 5V. The multi-function **EZ** button can be used for read rate tests and automatic calibration right out of the box, and it can also be programmed to perform a variety of other functions.

Programmable firmware also allows considerable control of multiple features, including three programmable relay outputs and new master and trigger inputs.

The scanner can be configured with **ESP** (**E**asy **S**etup **P**rogram), Microscan's proprietary scanner setup software. **ESP** can be downloaded from the Microscan website at **www.microscan.com**. You must be running Microsoft Windows 2000 or higher to use **ESP**.

Scanner Communication

There are five ways to program the scanner:

1. Microscan's Windows-based **ESP**, which offers point-and-click ease of use and visual responses to user adjustments.
2. Serial commands such as **<K100,1>** can be sent from ESP's Terminal or another terminal program.
3. Embedded firmware (onboard menus).
4. Symbol configuration.
5. The **EZ Button** on the top of the scanner.

Note: You can learn the current setting of any parameter by inserting a question mark after the command number, as in **<K100?>** To see all "**K**" commands, send **<K?>**.

Warning and Caution Summary

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna;
- Increase the separation between the equipment and receiver;
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected;
- Consult the dealer or an experienced radio/TV technician for help.

For connection to a UL-listed direct plug-in power unit marked Class II and rated 10 to 28 VDC at 5 watts or greater.

European models must use a similarly rated Class I or Class II power supply that is certified to comply with standard for safety EN 60950.

Use of controls, adjustments, or performance of procedures other than those specified herein may result in hazardous laser light radiation exposure.

There are no user-serviceable parts in the scanner. Opening the scanner voids the Microscan Systems, Inc. warranty and could expose the user to laser diode power.

The laser beam can be harmful to eyesight. Avoid eye contact with the laser beam. Never point the beam at other people, or in a direction where people may be passing.

Warning and Caution Summary (cont.)

The following label is located on side of the MS-3 Laser Scanner:

LASER LIGHT IS EMITTED FROM THIS APERTURE
AVOID EXPOSURE
LASERSTRAHLUNG-NICHT IN DEN STRAHL BLICKEN LASER KLASSE 2
650 nm
1.0 mW
38 µS
LASER RADIATION-DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT
CAUTION
IEC 60825-1 Ed.2 (2007)
CAUTION-CLASS 2 LASER RADIATION WHEN OPEN-DO NOT STARE INTO THE BEAM
PRODUCT COMPLIES WITH 21 CFR 1040.10 AND 1040.11 EXCEPT FOR DEVIATIONS PURSUANT TO LASER NOTICE NO. 50, DATED JUNE 24, 2007

- Embedded Laser Diode - 650nm, 12mW
- Wavelength: 650nm
- Beam Divergence: 0.6˚ (typ.)
- Pulse Duration: 38µs
- Maximum Power: 1mW
- Standard - IEC-60825-1 Ed. 2(2007)

Location of the MS-3's laser aperture:

CAUTION: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

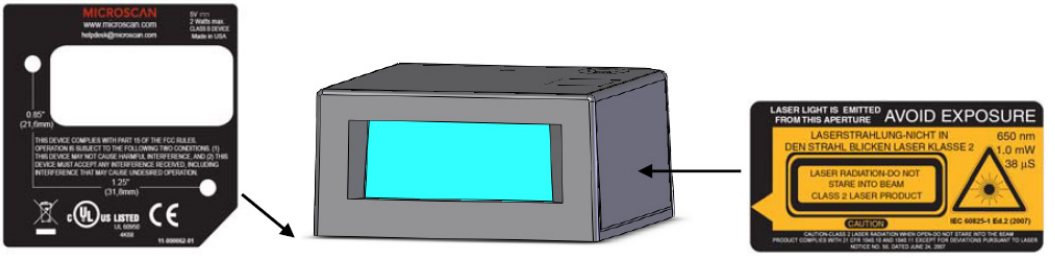
IMPORTANT: The MS-3 is intended for connection to a UL-listed direct plug-in power unit marked Class 2 and rated 5 VDC at 3.5 Watts, or greater if using electrical accessories.

European models must use a similarly rated Class 1 or Class 2 power supply that is certified to comply with standard for safety EN 60950.

Warning and Caution Summary (cont.)

Warning Label Placement

These labels are located on the MS-3 Laser Scanner:



On Bottom

On Side

Statement of Agency Compliance

This device has been tested in accordance with IEC 60825-1 2nd ed., and has been certified to be under the limits of a Class 2 Laser device.

The MS-3 has been tested for compliance with FCC (Federal Communications Commission) regulations and has been found to conform to all applicable FCC Rules and Regulations.

To comply with FCC RF exposure compliance requirements, this device must not be co-located or operate in conjunction with any other antenna or transmitter.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

The MS-3 has been tested for compliance with CE (Conformité Européenne) standards and guidelines, and has been found to conform to applicable CE standards, specifically the following requirements:

Radiated Emissions: EN 55022:2006 Class A 30-1000 MHz

Conducted Emissions: EN 55022:2006 Class A .15-30 MHz

The MS-3 has been tested by an independent electromagnetic compatibility laboratory in accordance with the applicable specifications and instructions.

The MS-3 is compliant with FDA performance standards for laser products except for deviations pursuant to laser notice no. 50, dated June 24, 2007.

Statement of RoHS Compliance

All Microscan readers with a ‘G’ suffix in the FIS number are RoHS-Compliant. All compliant readers were converted prior to March 1, 2007. All standard accessories in the Microscan Product Pricing Catalog are RoHS-Compliant except 20-500013-01 and 98-000039-02. These products meet all the requirements of “Directive 2002/95/EC” European Parliament and the Council of the European Union for RoHS compliance. In accordance with the latest requirements, our RoHS-Compliant products and packaging do not contain intentionally added Deca-BDE, Perfluorooctanes (PFOS) or Perfluorooctanic Acid (PFOA) compounds above the maximum trace levels. To view the document stating these requirements, please visit:

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32002L0095:EN:HTML

and

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:372:0032:0034:EN:PDF

Please contact your sales manager for a complete list of Microscan’s RoHS-Compliant products.

This declaration is based upon information obtained from sources which Microscan believes to be reliable, and from random sample testing; however, the information is provided without any representation of warranty, expressed or implied, regarding accuracy or correctness. Microscan does not specifically run any analysis on our raw materials or end product to measure for these substances.

The information provided in this certification notice is correct to the best of Microscan’s knowledge at the date of publication. This notice is not to be considered a warranty or quality specification. Users are responsible for determining the applicability of any RoHS legislation or regulations based on their individual use of the product.

In regards to “RoHS Directive 2011_65_EU” Microscan produces Monitoring and Control Instruments as well as Industrial Monitoring & Control Instruments as defined within the directive. Microscan has developed and is implementing a RoHS2 compliance plan with the intention of bringing all active products listed in our current marketing literature within full compliance as per the directive deadlines.

Key milestones for the transition plan are as follows:

- Complete internal product audit by July 2014.
- Initial “Monitoring and Control Instruments” RoHS2 compliant products available by December 2014
- Initial “Industrial Monitoring & Control Instruments” RoHS2 compliant products available by July 2015
- All new products introduced in 2015 are expected to be WEEE & RoHS2 compliant.

Microscan will mark the products with the ‘CE’ marking that complies with the RoHS2 process to acquire ‘CE’ certification per the example given: Example >> Machinery directive + EMC directive + RoHS2 = Declaration of Conformity.

Chapter

1

Quick Start

Chapter Contents

Step 1 Hardware Required 1-2
Step 2 Connect the System 1-3
Step 3 Position Symbol and Scanner 1-4
Step 4 Install ESP 1-5
Step 5 Select Reader Model 1-6
Step 6 Autoconnect 1-7
Step 7 Test for Read Rate 1-8
Step 8 Calibrate the Reader 1-9
Step 9 Save Calibration Settings for Power-On 1-10
Step 10 Configure the Reader 1-11

This section is designed to get the scanner up and running quickly so the user can get a sense of its capabilities and test sample bar code symbols. Detailed setup information for configuring the scanner for your specific application can be obtained in the subsequent chapters.

Step 1 — Hardware Required

Caution: If using your own power supply (see **"Warning and Caution Summary" on page i-xi**), be certain that it is wired correctly and supply voltage is 10 to 28VDC. Incorrect wiring or voltage can cause software or equipment failures.

If connecting to a host with an IB-131 Interface box, you will need the following:

Item[a]	Part Number	Description
1	FIS-0003-XXXXG	MS-3 laser scanner
2	FIS-0001-0035G	IC-332 Interface converter
3	99-000018-01	IB-131 Interface box
4		Host computer
5	61-300026-03	Null modem configuration cable
6	97-100004-15 (90-264 VAC, 24VDC)	Power supply
7	99-000017-01	Optional object detector

a. See **figure 1-1** for diagram of system.

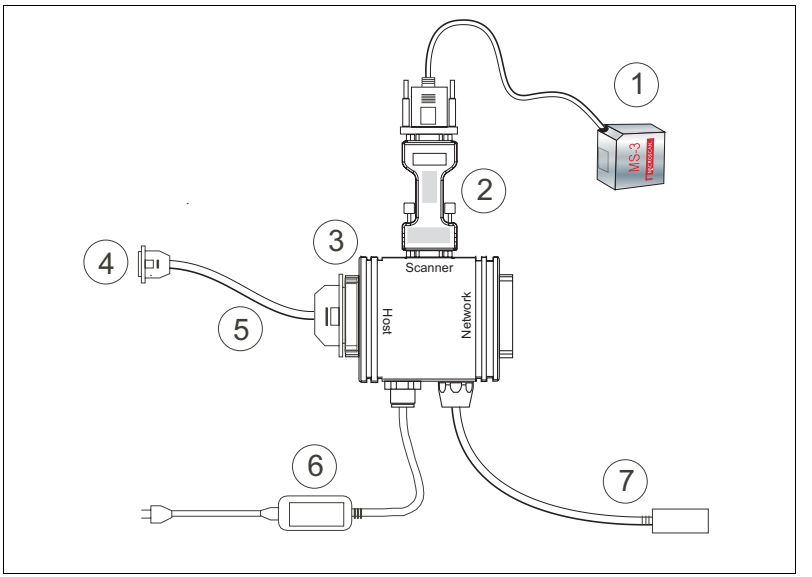


Figure 1-1 Hardware Required

Step 2 — Connect the System

Caution:

- Be sure all cables are connected **BEFORE** applying power.
- Always power down **BEFORE** disconnecting any cables.

To connect the system, do the following:

1. Connect the scanner (**1**) to the "SCANNER" connector on the IC-332 interface converter (**2**) using the attached 3-foot cable.[1]
2. Connect the IC-332 directly to the "SCANNER" 15 pin connector on the IB-131 (**3**).
3. Connect the host computer (**4**) to the IB-131 "HOST" 25-pin connector via the null modem cable (**5**).[2] (Refer to **"IB-131 Interface" on page A-8** for pin connections.)
4. Connect power supply (**6**) to the IB-131 "POWER" connector.
5. Apply power to the system.

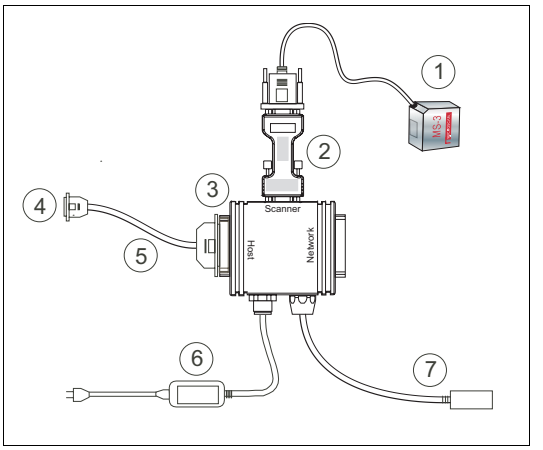


Figure 1-2 Hardware Connections

1. Since power supply is included in the single cabling assembly, the reader cable should not exceed 3 feet. RS232 cabling from the IB-131 to the host can be up to 47 feet provided it does not include power input.
2. If using your own null modem RS232 host cable, be certain that the host's TxD connects to the reader's RxD and the reader's TxD connects to the host's RxD.

Step 3 — Position Symbol and Scanner

Note: **Code 39** is the default code type enabled. If you are uncertain as to your symbology type, enable all codes by selecting the **Auto Discriminate** macro in **Terminal** mode.

1. Set up a symbol at the scanning distance you are using in your application.[1] (See **"Read Ranges" on page A-3**.)
2. Avoid bright light or IR light from other sources, including other scanners.
3. Pitch symbol or scanner slightly to avoid specular reflection, the return of direct, non-diffused light.

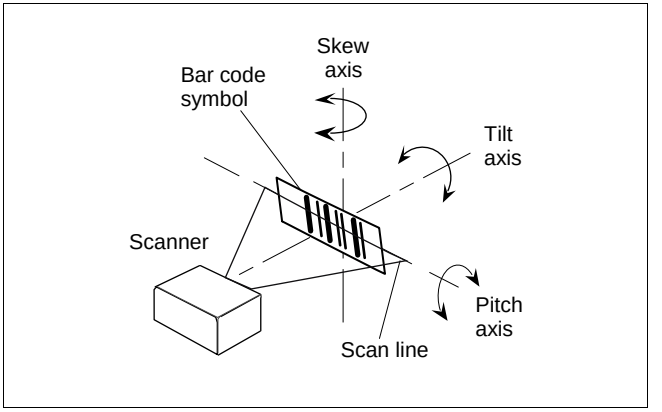


Figure 1-3 Symbol/Scanner Position

Note: If using an I 2/5 symbol, verify that the number of characters in the symbol being scanned matches the symbol length enabled for the I 2/5 symbol type. (Default is 10 and 6.) See **"Interleaved 2 of 5" on page 5-13**.

1. Consult **table A-1** and **table A-2 on page A-3**.

Step 4 — Install ESP

(**ESP** stands for Easy Setup Program.)

Once your scanner is connected to a host computer with Windows™ operating system (XP or above), you can use **ESP** (Easy Setup Program) for configuration and control.

To install ESP from the Microscan Tools Drive:

- Insert your Microscan Tools Drive into a USB port on your computer.
- Click **Setup.exe** and follow the prompts.

To download ESP from the Web:

- Go to **www.microscan.com**.
- Click **Setup.exe** and follow the prompts.
- At the end of the install process, copy a shortcut **ESP** icon onto your desktop.

- Click the **ESP** icon to run the program.

Minimum System Requirements

- 233 MHz Pentium PC
- Windows 8, 7, Vista, or XP operating system (32-bit or 64-bit)
- Internet Explorer 6.0 or higher
- 128 MB RAM or greater
- 160 MB free disk space
- 800 x 600 256 color display (1024 x 768 32-bit color recommended)

Step 5 — Select Reader Model

When you start the program, the following menu will appear.

Note: If you need to select another model later, you can find it in the **App Mode** under **Model** on the menu bar.

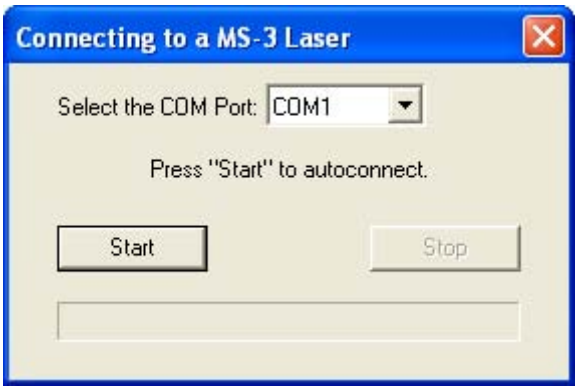
1. Select **MS-3** laser from the menu and click **OK**.

   If you do not want to make this selection every time you load ESP, uncheck **Show this window at Startup**.

2. Select the default name, for example **MS-3 Laser-1**, or type in a file name of your choice and click **OK.**
3. Click **Yes** when the **connect to the reader** dialog appears.

Step 6 — Autoconnect

1. In the **Connecting to...** dialog, if your communications port is not the default **COM1**, use the pull down arrow to change your communications port.



2. Click the **Start** button.

   When connected, the **CONNECTED** message will appear in a green box in the status bar on the bottom right of the dialog.

3. If connection fails, enable a different Com port, check connections, and try again.

Tip: If you do not see either the CONNECTED or DISCONNECTED message at the bottom of your dialog, try expanding the ESP window horizontally.

Important Note: When you connect to the reader, the reader's settings will be loaded into ESP.

Step 7 — Test for Read Rate

With this test you can learn the percentage of decodes per images captured by observing the LEDs (20% through 100%) on the top of the MS-3 which are active during a read rate test. If the results are not satisfactory, move on to **"Calibrate the Reader" on page 1-9**.

By ESP

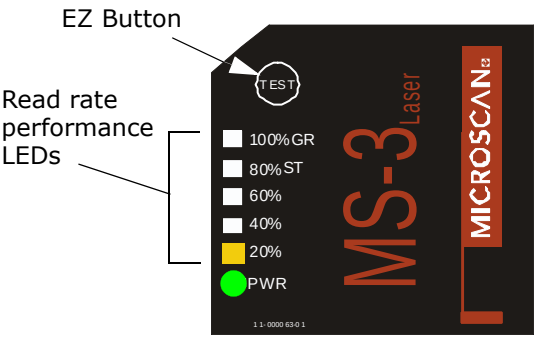
After connecting to the scanner, ESP will open in **Easy Setup Mode**.

1. Click the EZ Button in **Easy Setup Mode** to begin the read rate test.

2. Follow the instructions in **Easy Setup Mode** screen.
3. To end the **Read Rate** test, click the **Stop** button.

By the EZ Button

1. Press and hold the EZ Button on the MS-3 until you hear one beep and see o ne LED momen-tarily turn amber. This will signal the beginning of the read rate routine.[1]
2. To end the read rate test press the EZ Button and quickly release.



1. This assumes that the default functions of the EZ Button have not been re-programmed.

Step 8 — Calibrate the Reader

If, after doing the read rate test, the results are not satisfactory, try the calibration routine.

During the calibration routine, the scanner attempts various settings to determine the optimum decode rate for the given conditions. In this process it might do the following:

- Adjust laser power
- Adjust mirror motor speed
- Adjust AGC gain
- Enable Autodiscrimination (read several symbol types)

The test will end automatically when the optimum combination of settings has been achieved.

By ESP

Click the **Calibrate** button in **Easy Setup Mode** to begin the read rate test.

You can observe the progress of the calibration routine on the Calibration popup.

Note: You can also calibrate the scanner in the **Calibration** menu in the **Apps Mode**.

By the EZ Button

Press and hold the EZ Button until you hear two beeps and see two amber performance LEDs turn amber to indicate that the calibration is in progress.

The scanner will beep once at the end of calibration.

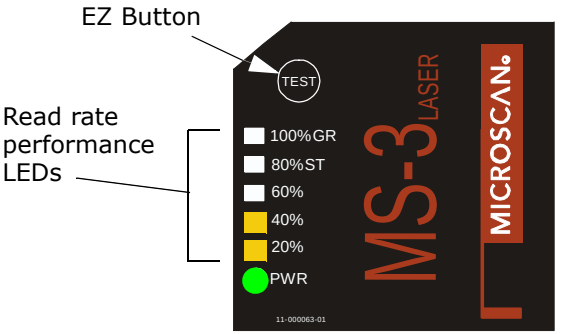


Figure 1-4 Calibration

Step 9 — Save Calibration Settings for Power-on

After calibrating the MS-3, you can save your new settings to be available on power-on.

By ESP

Caution: If you have settings in the scanner that you have not yet loaded into ESP, the ESP settings will overwrite the scanner's settings when you save. Under these conditions, it is highly recommended that you first do **Receive Reader Settings** before you save for power-on.

After testing and/or calibrating the scanner, you can save the settings for power-on by clicking the **Save** button.

By the EZ Button

Press and hold the EZ Button until you hear three beeps and see three performance LEDs momentarily turn amber.[1]

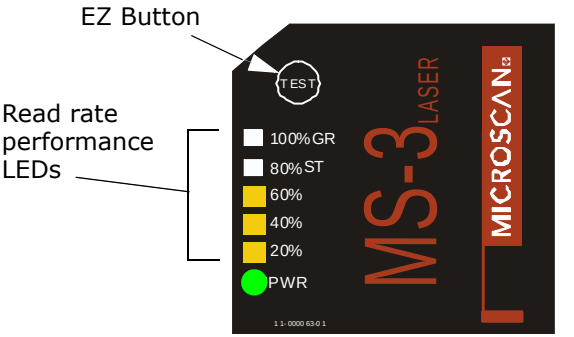


Figure 1-5 Save Settings

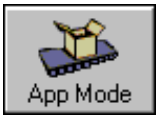
1. This assumes that the default functions of the EZ Button have not been re-programmed.

Step 10 — Configure the Reader

See the succeeding chapters and Appendices to see specific configuration command explanations for both ESP and serial commands.

By ESP

To change reader settings, or to access the utilities or terminal window, click on the **App Mode** button.



See **Chapter 2, "Using ESP."**

By Serial Commands

From your terminal program or the terminal screen in ESP, you can enter serial string commands and configuration and utility commands as described in this manual.

See **"Serial Configuration Commands" on page A-13** and **"Summary of Utilities Commands" on page 11-3**.

Note: You can learn the current setting of any parameter by inserting a question mark after the number, as in **<K100?>** To see all "K" commands, send **<K?>**.

Chapter

2

Using ESP

Chapter Contents

Setup Mode 2-2
Application Mode 2-3
Pulldown Menus 2-4
Connect Menu 2-9
View 2-11
Navigating in ESP 2-12
Send/Receive Options 2-13

This section is designed to help you understand the structure, elements, and application of the ESP (Easy Setup Program).

When you start up ESP, unless otherwise specified, you will enter the **Setup Mode** for initial setup. From there, you move easily into the **App Mode** (application mode) where you can access several configuration and utilities menus.

Setup Mode

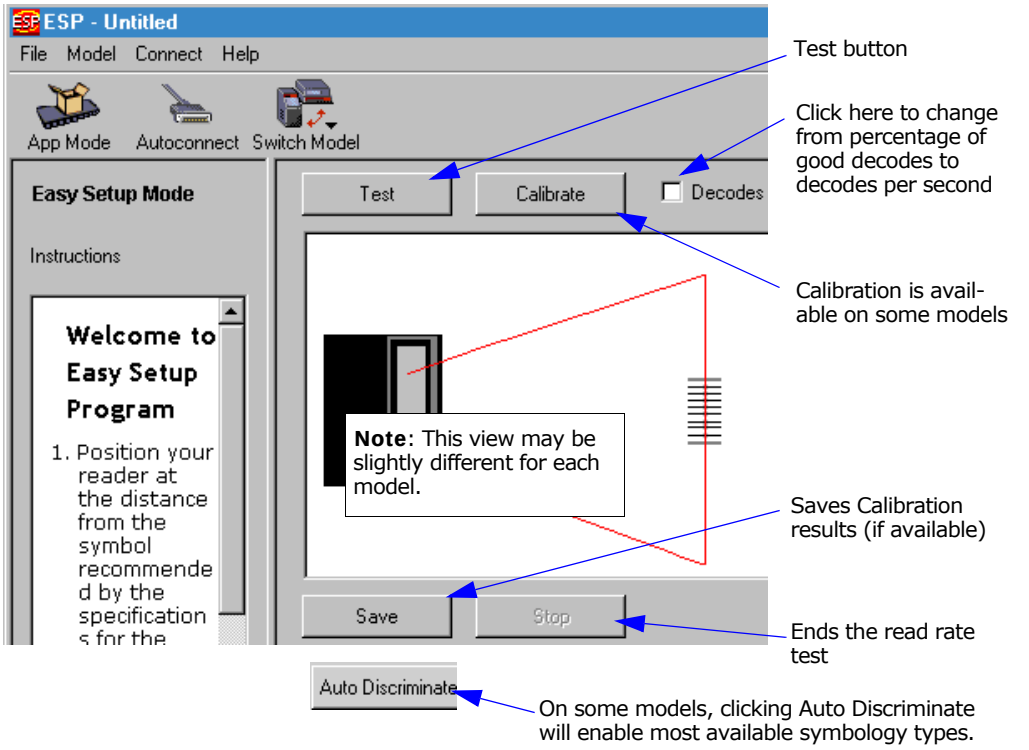
In **Setup Mode** you are presented with the **Test** option and if appropriate for your application, **Calibration**. After connecting to your scanner (or reader) the **Setup Mode** will first appear. This will provide you with instructions specific to your model that will help you in positioning, testing, and if appropriate, calibrating.

Test

Click the Test button to start the read rate test for a quick indication of the read capabilities and the limits of your application. When **Decodes per Second** is unchecked, the test will count the percentage of decodes relative to the number of actual scans. Click **Stop** to end the test.

Calibrate

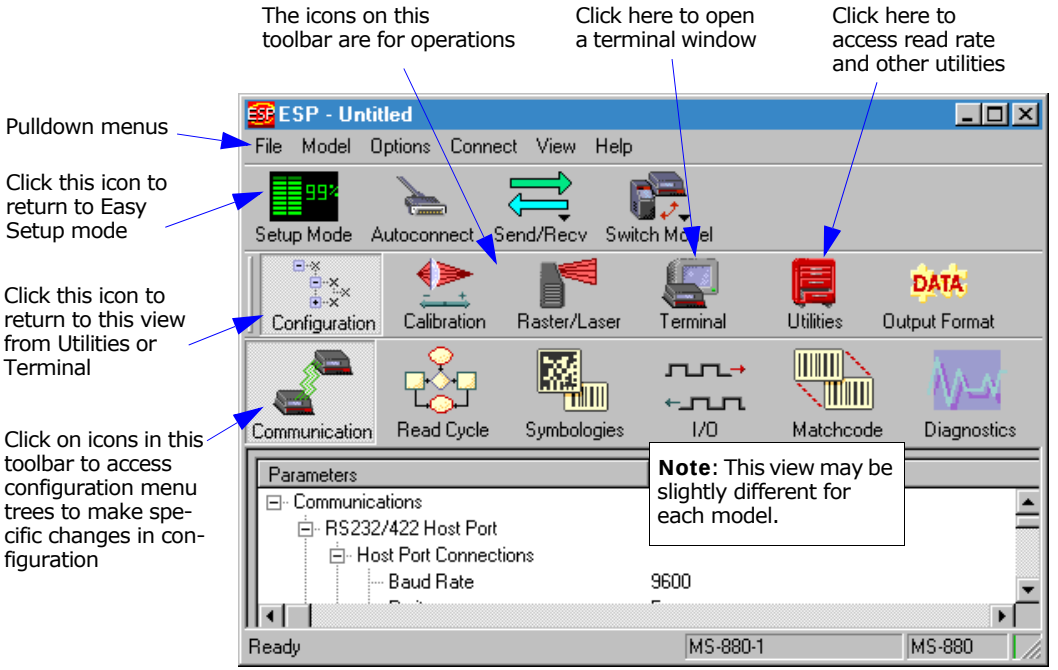
Some models include a calibration routine that will optimize reads by comparing read rates at various settings in focal lengths, scan speeds, and gain settings.


ESP - Untitled
File Model Connect Help
App Mode
Autoconnect
Switch Model
Easy Setup Mode
Instructions
Welcome to Easy Setup Program
1. Position your reader at the distance from the symbol recommended by the specification s for the
Test
Calibrate
Decodes
Note: This view may be slightly different for each model.
Save
Stop
Auto Discriminate
Test button
Click here to change from percentage of good decodes to decodes per second
Calibration is available on some models
Saves Calibration results (if available)
Ends the read rate test
On some models, clicking Auto Discriminate will enable most available symbology types.

Application Mode

From **Setup Mode**, you can click on the **App Mode** button to access specific configuration menus, utilities, and a terminal window where serial commands can be entered.

Note that the **App Mode** and **Setup Mode** buttons appear in the same position to allow easy switching between these primary modes.



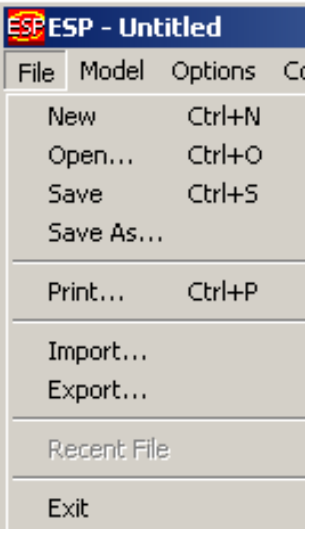
Note: For specific information on any of the icons shown above in the operations bar or configuration bar, see specific chapters in this document.

Pulldown Menus

File

New

Whenever **New** is selected, the default configuration of ESP is loaded.



Open/Save

When **Save** or **Save As** is selected, the ESP configuration is saved to the host computer's hard drive and available whenever the same file is selected under **Open**.

Important: When you save menu changes to your hard drive, these changes are not saved to your reader. **Figure 2-1** shows how settings can be saved and received between ESP and the reader and ESP and the host hard drive.

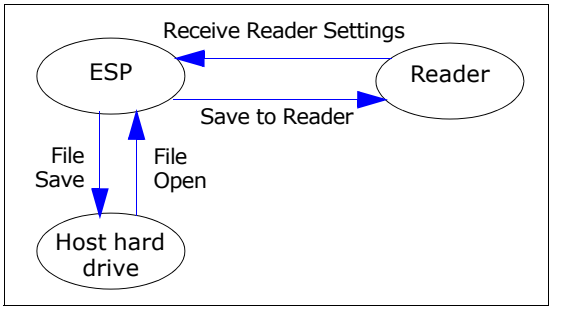
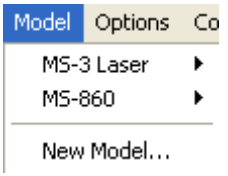


Figure 2-1 How Settings are Saved

Import/Export

Import converts the ASCII settings from a text file to ESP configuration settings.
Export converts the active ESP configuration settings to an ASCII text file.

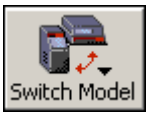
Model



In **Model** you can select between models. When you choose another model, your current connection with your present model will be terminated.

To connect to another model, select **New Model**, choose a new model and click **OK**.

Note that all the models you have enabled by selecting will continue to appear in the Model menu and that the same menu is repeated when clicking the **Switch Model** icon.

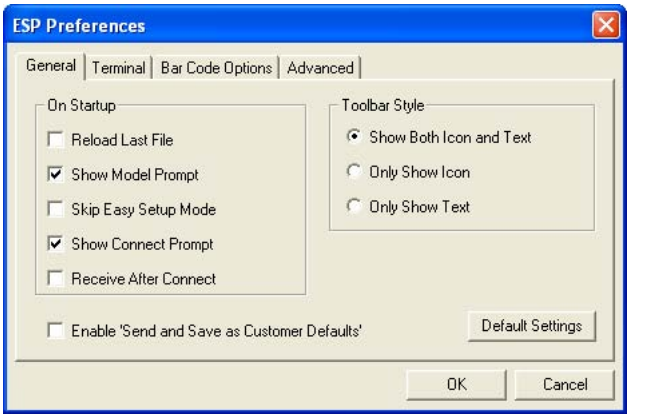


When you save your ESP file, you will be saving the settings of all the models defined in a single ESP file.

Options

You can use the **Options** menu save memos and set up **ESP Preferences**.

Note: Preferences will be saved and be loaded into ESP when ESP is opened next, whether or not you save the ESP file to the computer.



Preferences

General tab

Reload Last File

At startup, reloads the last file saved to the computer.

Show Model Prompt

At startup, remembers the last connected model and displays it in the **Connecting...** dialog whenever you attempt to connect.

Skip Easy Mode

At startup, Skips the **Easy Mode** and opens directly in the application mode.

Show Connect Prompt

At startup, displays the **Would you like to connect...** prompt.

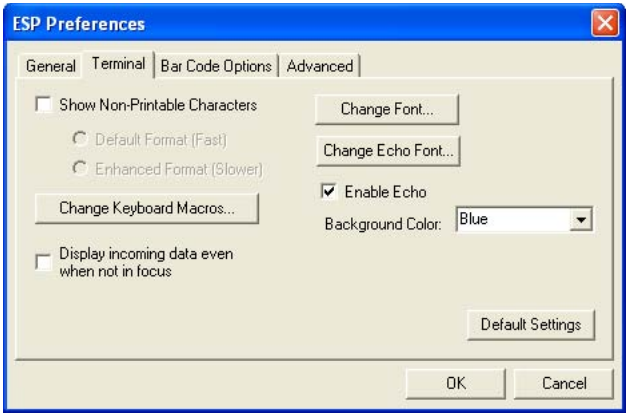
Receive After Connect

At startup, loads the reader's settings into ESP. (This is not recommended if you want to preserve your ESP settings for future use.)

Enable 'Send and Save as Factory Settings'

At startup, enables the **Send and Save as Factory** option in the **Send/Recv** command.

Terminal tab



When **Show Non-Printable Characters** is checked, characters such as CRLF will be displayed in the terminal window. When **Enhanced Format** is checked, the characters are displayed with more detailed formatting.

Change Keyboard Macros

In this dialog you can first select the function key and then enter your macro keystrokes in the associated key map. For example, to make Ctrl-F5 the keystroke to enable send a trigger character, select **F5**, then in the Ctrl row, enter **<trigger character>** and click **OK**. Then whenever the Ctrl-F5 keystroke is pressed, the trigger character will start the read cycle.

Change Font

Sets the font characteristics for the commands that you type in the terminal window.

Change Echo Font

Sets the font characteristics for text that is echoed back to the screen from the reader.

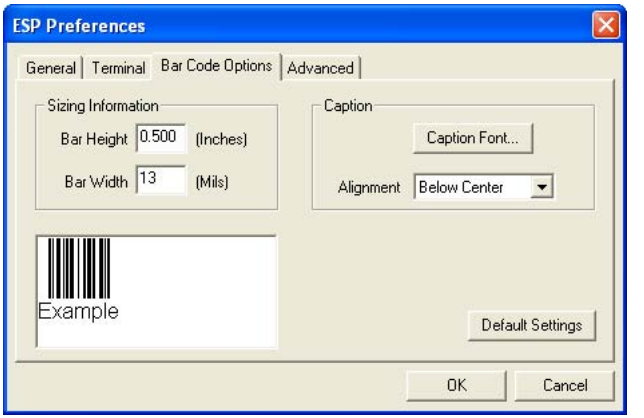
Toolbar Style

By user selection, displays toolbar buttons as icons, text only, or both (default).

Note: See also **Chapter 14, "Terminal Mode."**

Bar Code Options tab

Sets up the sizing, font, and caption parameters for the bar codes that you can create and print from the **Bar Code Options Dialog** under **View**.



Sizing Information

Sets the bar height (in inches) and bar widths (in thousands of an inch) of the symbols. A bar width of 13 is 0.013 inches.

Caption

Sets the characteristics of caption font and its placement in relation to the bar code symbol.

Advanced tab

As indicated.

Document Memo

Whatever you type into the Document Memo will appear in a text box whenever your cursor hovers over the Document Memo option.

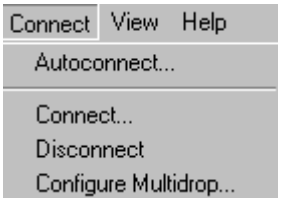
Model Memo

Memos created in **Model Memo** are specific to the model enabled when the message was created.

Connect Menu

Autoconnect

Generally **Autoconnect** will be the quickest way that ESP can get connected to a reader. **Autoconnect** will try connecting at the most common communications settings and step through the various settings until they match up with the host's settings.



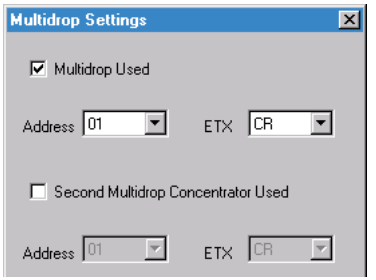
Connect

When you select **Connect**, you will need to manually select the communications settings from a popup dialog.

Configure Multidrop

To connect to the reader by Multidrop, you will need a multidrop concentrator such as the MS-Connect 5100 and the required power supplies and cabling to communicate with your scanner(s).

1. From the **Communications** drop down menu in ESP, select **Configure Multidrop** to bring up the **Multidrop Settings** dialog.



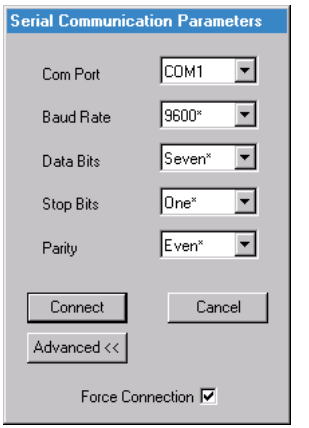
2. If necessary, change the default address to match the address of your multidropped scanner and click **OK**.

   If the host serial port is not connected in ESP, you will see the following popup message:

   ESP is not currently connected to the multidrop concentrator. Do you wish to establish a connection now?

3. Click **Yes**.

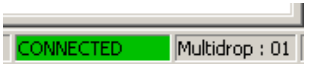
   You will see a **Serial Communication Parameters** dialog as shown on the next page.



4. Select the concentrator's host port communications settings.

   When you click **Connect**, you will be connecting to your concentrator, which can then relay commands to the scanner whose address was set in the **Multidrop Settings** dialog.

5. Click **Connect**.
6. You should see the **CONNECTED** message in green at the bottom of the window along with the scanner's **Multidrop** address.



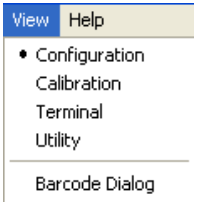
7. Do **Retrieve Scanner Settings** to upload scanner's configuration (**Step 4**). If upload fails, return to the **Serial Communication Parameters** dialog and make the corrections.
8. Follow the same procedure for connecting other scanners to your multidrop network.

Note: For more information, see the **MS-Connect 5100 User Manual.**

View

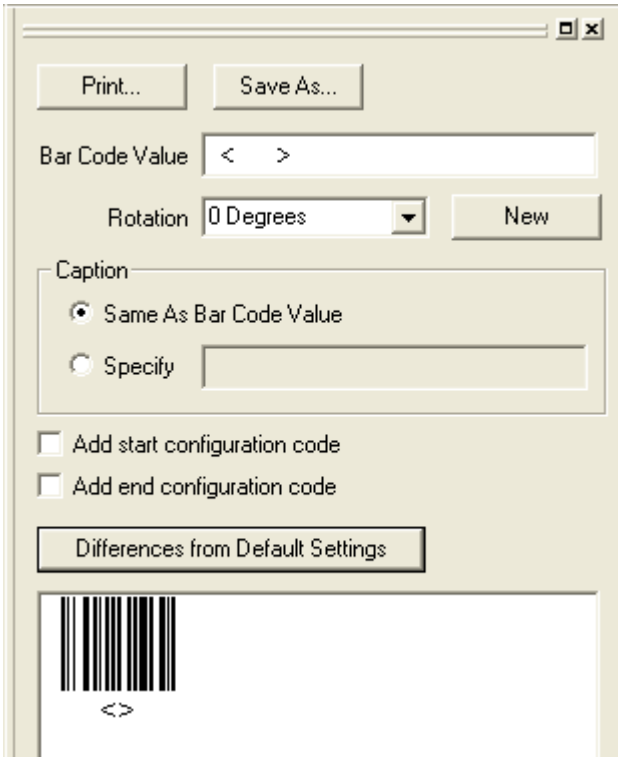
View indicates the current view (with a dot before the item) and allows you to quickly move to other views which are also accessed by clicking the icons on the toolbars.

It also allows you to access the Barcode Dialog.



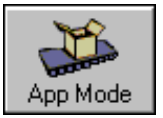
Barcode Dialog

In the Barcode Dialog you can create bar code symbols by directly typing in the text bar code text you want to appear in Code 128 bar code symbols. This is a very useful tool for creating configuration symbols which allows you to configure your reader by reading the bar code symbols you print out. To configure the size, text and caption parameters, see **"Bar Code Options tab" on page 2-8**.



Navigating in ESP

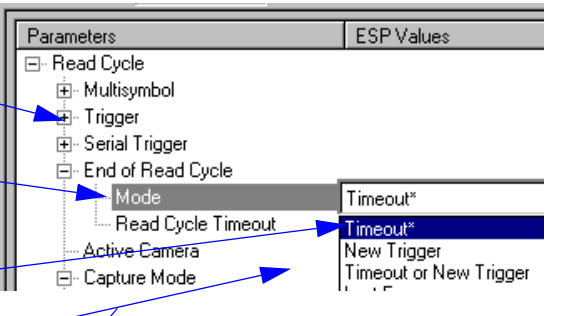
To change reader settings, or to access the utilities or terminal window, click on the **App Mode** button.



To return to the **Easy Mode**, click on the **EZ Mode** button.

To make changes to a configuration setting in the menu trees:

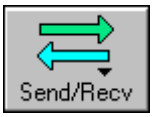
1. **Left click** on the **+** to expand tree
2. **Double click** on parameter and click once in selection box to view options.
3. Place your curser in the selection box, scroll down to the setting you want to change and **click** once on the setting.
4. **Left click** again on the open screen to complete the selection.



5. **Right click** on the open screen and select **Save to Reader** to implement the command in the reader.

Send/Receive Options

To access **Receive**, **Save** and **Default** options, click the **Send/Recv** button: You can also access this selector by right-clicking in any of the configuration views.



Receiving

From the **Send/Recv** selector, select **Receive Reader Settings.**

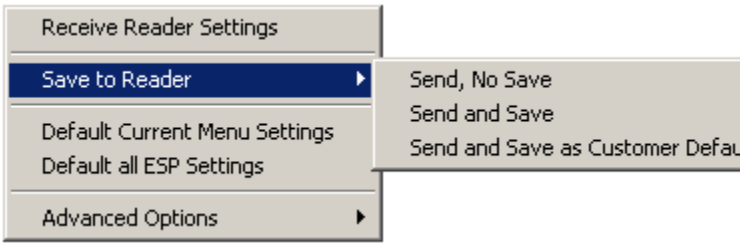
Caution: Do no select this option if you do not want to upload the reader's settings. For example, if your ESP file has a number of custom settings that you want to maintain and download into the reader, these settings would be lost by choosing **Yes**.

This is useful if you want to receive (upload) the reader's settings and save them as a computer file for later retrieval. For example, if your reader has settings that you do not want to change, choosing **Yes** would allow you to load those settings to ESP and save as an ESP file for later retrieval.

Receiving the reader's settings will also assure that you will not be subsequently saving any unwanted changes that you or someone else previously made in ESP.

See **"Send/Receive Options" on page 2-13** for more detail.

Saving



1. **Send, No Save**. (same as <A>)

   This saves ESP settings to current memory.

2. **Send and Save**. (same as <Z>)

   This activates all changes in current memory ***and*** saves to the reader for power-on.

3. **Send and Save as Customer Defaults.** (same as <Zc>)

   (This option will be visible only if you had checked **Enable 'Send and Save as Customer Defaults'** in **ESP Preferences** in the **Options** menu.)

   Use this to save your own set of default settings that you can quickly retrieve with a <Zrc> command.

For more on defaulting and saving settings, see **"Defaulting/Saving/Resetting" on page A-20**.

Defaulting

When you select **Default Current...** or **Default all ESP...** you are only defaulting the ESP settings.

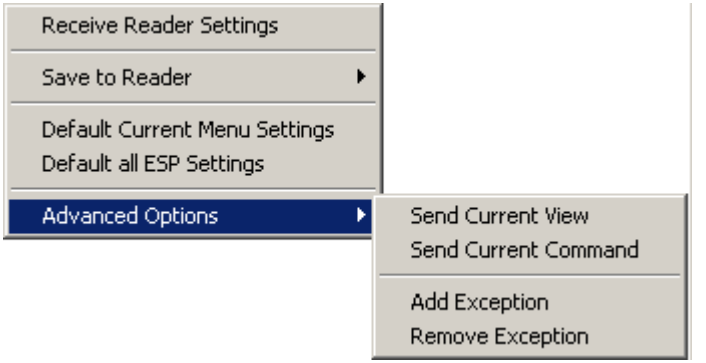
Advanced Options

Send Current View

This is the same as **Save to Reader, Send No Save** except that only the commands in the current menu tree are sent.

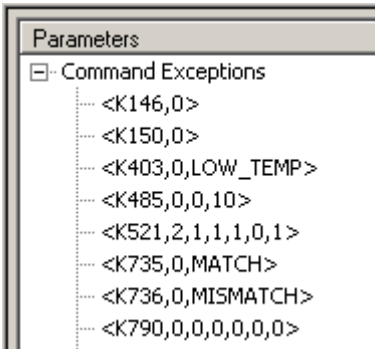
Send Current Command

This is the same as **Send Current View** above, but only saves the command that is currently selected.



Add Exceptions

After you perform a **Receive from Reader** command[1] and you click on the **Add Exception** option you may see a list of serial commands that looks like the example to the right. These are serial commands that may be in your reader's firmware, but not included or different from your current ESP software.



You can edit these commands by double-clicking on them and changing as needed.

When exceptions are present, you can also access them from an **Exceptions** button that will appear on the Applications button bar.

It is important to note that these commands will be saved to your reader whenever you do a **Save to Reader** command or send an **<A>** or a **<Z>** command.

Also, if there is a corresponding ESP menu item, the ESP Value column for that item will be blank following a **Receive from Reader** command.

1. From the Send/Recv button or right-clicking from within the tree menus.

Chapter 3 Communications

Chapter Contents

Communications by ESP 3-2
Communications By Serial Command 3-2
Password Protection 3-3
RS-232/422 Host Port 3-4
RS-232 Auxiliary Port 3-11
Preamble 3-20
Postamble 3-21
LRC Status 3-22
Intercharacter Delay 3-22

The ESP™ (Easy Setup Program), configuration changes can be made in the ESP menus, then sent and saved to your reader. The user can also send serial commands to the reader via the ESP's Terminal window.

This section includes connecting parameters and options for communicating by the auxiliary port and various interfaces.

Note: When assigning characters in user-defined fields, the characters **NULL < >** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Note: You can learn the current setting of any parameter by inserting a question mark after the number, as in **<K100?>**. To see all "K" commands, send <K?>.

Note: Default settings for establishing communications are:

Baud = **9600**

Parity = **Even**

Stop Bits = **One**

Data Bits = **Seven**

Flow Control = **None**

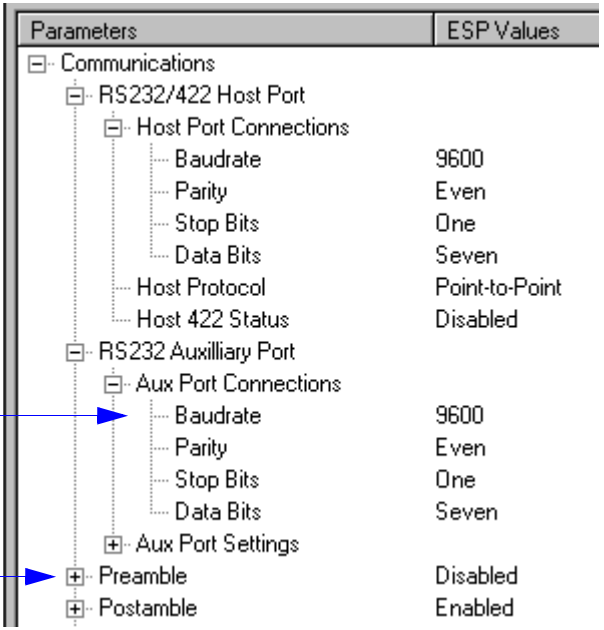
Note: You can learn the current setting of any parameter by inserting a question mark after the number, as in **<K100?>** To see all "K" commands, send **<K?>**.

Communications by ESP

Click this button to bring up the **Communications** menu.

To change a setting, **double-click** the setting and use your cursor to scroll through the options.

To open nested options, **single-click** the +.



Note: You can learn the current setting of any parameter by inserting a question mark after the number, as in **<K100?>** To see all "K" commands, send **<K?>**.

Communications By Serial Command

Command Title	Format
Password Status	<**K732,***status*>
Password Entry, Change	<**K733***password,new password*>
Host Port Parameters	<**K100,***baud,parity,stop bits,data bits*>
Host Protocol	<**K140,**protocol>
Host RS422 Status	<**K102,***status*>
Aux Port Parameters	<**K101,***aux port mode,baud rate,parity,stop bits,data bits,daisy chain status,daisy chain ID*>
Preamble	<**K141,***preambole status,preamble*>
Postamble	<**K142,***postamble status,postamble*>
LRC Status	<**K145,***status*>
Intercharacter Delay	<**K144,***intercharacter delay*>

Password Protection

Note: Password protection options are entered serially and are not available in ESP menus.

Usage: **Password Protection** when enabled prevents the scanner's parameters from being modified but does not affect the flow of data from the scanner or its response to read only commands.

Definition: Can require a password for any serial or menu command change.

Password Entry: From a terminal screen enter **<K733*password*>**. (Do not put a comma between K733 and the password.)

If you enter the password correctly, you will see the password echoed to the screen and you will then be able to make changes to the scanner's parameters.

Enter the password once and the scanner's command protection is temporarily unlocked until the scanner is turned off or reset. If a reset occurs then the password will need to be entered again.

Password Status

Definition: If **Password Status** is set to **Disabled**, then no parameters are off limits.

If **Password Status** is set to **Enabled**, then this option cannot be subsequently disabled until the password defined in <K733> is entered. This parameter is non-volatile and will be included in any <Z> or <Zc> parameter save.

Serial Cmd: <**K732,***status*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

New Password

Definition: To change the password from the current password, enter the current password, a comma, and the new password. If successfully entered, the new password will be displayed and the command change protection temporarily removed.

Serial Cmd: <**K733***password,new password*>

Note: Follow this with a <Z> or <Zc> to save for power-on.

Default: **MICRO**

Options: Any ASCII string up to 8 characters.

RS-232/422 Host Port

Host Port Connections

Baud Rate (host port)

Usage: Can be used to transfer data faster or to match host port settings.

Definition: The rate at which the reader and host transfer data back and forth.

Serial Cmd: <**K100,*baud rate***,*parity,stop bits,data bits*>

Default: **9600**

Options:

0 = 600	3 = 4800	6 = 38.4K
1 = 1200	4 = 9600	7 = 57.6K
2 = 2400	5 = 19.2K	8 = 115.2K

Parity (host port)

Usage: Only changed if necessary to match host setting.

Definition: An error detection routine in which one data bit in each character is set to 1 or 0 so that the total number of 1 bits in the data field is even or odd.

Serial Cmd: <**K100,***baud rate*,***parity***,*stop bits,data bits*>

Default: **Even**

Options: 0 = None 1 = Even 2 = Odd

Stop Bits (host port)

Usage: Only changed if necessary to match host setting.

Definition: One or two bits added to the end of each character to indicate the end of the character.

Serial Cmd: <**K100,***baud rate,parity*,***stop bits***,*data bits*>

Default: **One**

Options: 0 = One 1 = Two

Data Bits (host port)

Usage: Only changed if necessary to match host setting.

Definition: Number of bits in each character.

Serial Cmd: <**K100,***baud rate*,*parity*,*stop bits*,***data bits***>

Default: **Seven**

Options: 0 = Seven 1 = Eight

Host Port Protocol

Usage: In general, the point-to-point protocols will work well in most applications. They require no address and must use RS-232 or RS-422 communications standards.

Definition: Protocols define the sequence and format in which information is transferred between the scanner and the host, or in the case of **Multidrop**, between scanners and a concentrator.

Serial Cmd: <**K140,***protocol*>

Default: **Point-to-Point**

Options:

0 = Point-to-Point
1 = Point-to-Point with RTS/CTS
2 = Point-to-Point with XON/XOFF
3 = Point-to-Point with RTS/CTS & XON/XOFF
4 = Polling Mode D
5 = Multidrop
6 = User Defined
7 = User Defined Multidrop

If selecting one of the options from 0 to 4 (**Point-to-Point**, **Point-to-Point with RTS/CTS**, **Point-to-Point with XON/XOFF**, **Point-to-Point with RTS/CTS and XON/XOFF**, or **Polling Mode D**), use the <**K140,***protocol*> format.

Option 5 through 7 are special cases and discussed later in this section.

Point-to-Point (standard)

Usage: Used only with RS232 or RS422.

Definition: Standard **Point-to-Point** requires no address and sends data to the host whenever it is available, without any request or handshake from the host.

Serial Cmd: <**K140,*0***>

Point-to-Point with RTS/CTS

Usage: A reader initiates a data transfer with an RTS (request-to-send) transmission. The host, when ready, responds with a CTS (clear-to-send) and the data is transmitted. CTS and RTS signals are transmitted over two dedicated wires as defined in the RS-232 standard.

Used only with RS232.

Definition: **Point-to-Point with RTS/CTS** (request-to-send/clear-to-send) is a simple hardware handshaking protocol that allows a reader to initiate data transfers to the host.

Serial Cmd: <**K140,1**>

Point-to-Point with XON/XOFF (Transmitter On/Off)

Usage: If an XOFF has been received from the host, data will not be sent to the host until the host sends an XON. During the XOFF phase, the host is free to carry on other chores and accept data from other devices.

Used only with RS232.

Definition: This option enables the host to send the XON and XOFF command as a single byte transmission command of start (^Q) or stop (^S).

Serial Cmd: <**K140,2**>

Point-to-Point with RTS/CTS & XON/XOFF

Usage: Used only with RS232.

Definition: This option is a combination of **Point-to-Point with RTS/CTS** and **Point-to-Point with XON/XOFF.**

Serial Cmd: <**K140,3**>

Polling Mode D

Usage: When in **Polling Mode D,** an address of 1 is automatically displayed on the configuration screen. However, during transmission, a 1C hex poll address (FS) and a 1D hex select address (GS) are substituted for the 1.

Definition: Like **Point-to-Point**, **Polling Mode D** requires a dedicated connection to the host; but unlike **Point-to-Point**, it requires an address and must wait for a poll from the host before sending data.

Serial Cmd: <**K140,4**>

Multidrop

See also ***Quick Start Help*** for Multidrop setup.

Usage: The MS-Connect 5100 can be used as a concentrator to a single host port connection.

When **Multidrop** is selected, the protocol characters for RES, REQ, etc. are assigned automatically.

Definition: **Multidrop** allows up to 50 devices to be connected to a single RS485 host, with the scanner assigned an unique address (from 01 to 50).

Multidrop Addresses: Each address has its own separate poll and select address (from 1C to 7F hex).

Options: 01 through 50

Serial Cmd: If selecting **Multidrop** fan address must be defined and appended to the command string.

Format: <**K100,5**,*address[01 to 50]*>

Note: Scanners linking up to a Microscan MS-Connect 5100 multidrop concentrator must be configured in standard multidrop protocol.

User Defined Point-to-Point

Usage: Useful for developing custom protocols in polled or unpolled mode.

Definition: **User Defined Point-to-Point** allows the user to customize the point-to-point protocol.

Serial Cmd: <**K140,6**,*RES,address,REQ,EOT,STX,ETX,ACK,NAK,from host*>

User Defined Address

Definition: **User Defined** is considered to be in a polled mode only if an address has been assigned.

Serial Cmd: <**K140,6**,*RES,**address**,REQ,EOT,STX,ETX,ACK,NAK,from host*>

Default: No address

Options: Any ASCII character except a null.

User Defined Example

Definition: Example: ACK/NAK protocol can be configured using **User Defined**. The scanner will transmit data to the host when an **ACK** is received. If a **NAK** or response timeout occurs, the scanner will re-send the data to the host up to 3 more times before aborting.

Tip: To use **User Defined Point-to-Point**, first select **Point-to-Point <K100,0>** and then **User Defined <K100,6>**.

Example: To select an unpolled ACK/NAK **User Defined** protocol with LRC disabled, send **<K100,0><K100,6,,,,,,,^F,^U><Kc0>**. ACK and NAK will be displayed in the menu.

Serial Cmd: <**K140,6**,*RES,address,***REQ,EOT,STX,ETX,ACK,NAK**,from host*>

Default: **No assignment**

Options: Any ASCII character except a null. Control characters can be used to define RES through NAK in serial commands.

From Host

Definition: This option allows the handshaking protocol to be initiated from the host, if not configured in an unpolled mode. Messages sent to the host will include the scanner's defined protocol. The status of **From Host** determines if messages sent from the host to the scanner must include the defined protocol. If **From Host** is disabled, the defined protocol is not included. If **From Host** is enabled, the defined protocol must be included.

Serial Cmd: <**K140,6**,*RES,address,REQ,EOT,STX,ETX,ACK,NAK,***from host**>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

User Defined Multidrop

Note: Any ASCII character except a null (00) and a ^A (01) can be assigned as an address. Control characters can be used to define RES through NAK in serial commands. **"Communication Protocol Commands" on page A-11**.

Usage: This option is used when connecting to a concentrator or other device that does not match standard multidrop protocol.

If selecting **User Defined Multidrop** (7), complete the format by either choosing new parameters or place commas where unchanged data fields occur.

Definition: **User Defined Multidrop** allows the user to customize the polling protocol.

Serial Cmd: <**K140,7**,*RES*,*address*,*REQ*,*EOT*,*STX*,*ETX*,*ACK*,*NAK*>

For **User Defined Multidrop**, first select **Multidrop <K140,*5*>**, then **User Defined Multidrop <K140,7...>**.

Address: Any single character (02 hex to 7E hex) in the ASCII table can be assigned as the address character. The character chosen is used as the poll character and the subsequent ASCII character becomes the select character. For example, if a **^B** (02 hex) is selected as the address, **^C** (03 hex) becomes the select address that the host will use in sending host select commands.

Note: Definitions of commands in **User Defined** and **User Defined Multidrop** must be duplicated in host applications to enable poll and select sequences to execute correctly during transmission.

Note: Typically, parameters in **User Defined Multidrop** are defined by first enabling **Multidrop**, then enabling **User Defined Multidrop**. This pre-loads multidrop characters into the parameters. Then changes are made to individual characters to match the host or other requirements.

Host RS-232/422 Status

Used only in **Point-to-Point** protocol, and not with RTS/CTS.

Usage: Only changed if necessary to match host setting.

Definition: Enables RS422. When RS422 is enabled, RS232 is disabled.

Serial Cmd: <**K102,***status*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Whenever RS422 is disabled, RS232 is enabled in the background. However, when **Multidrop** is enabled, the functioning protocol is RS485 regardless of the displayed status of RS422. Before enabling RS422, first double-check that **Multidrop** is not enabled.

RS-232 Auxiliary Port

Note: The aux port cannot be used when the host port is set to RS422 or **Multidrop**.

As with the host port parameters, the auxiliary terminal's settings (baud rate, parity, stop bits, and data bits) must be identical with those of the auxiliary device.

Usage: These commands set the communication parameters with the auxiliary port which can be used to configure menus, send data to the host, display data transmissions originating from the host of the scanner, and relay data from other scanners set in tandem (daisy chained). If the scanner's host port needs to be dedicated to the host, but configuration must be done on the fly, the auxiliary port can be set to accept configuration changes by **Command Processing** **(page 3-17**).

Definition: An auxiliary port connects the scanner to a remote display or to other scanners that can display or transfer data.

Aux Port Connections

As with the host port parameters, the auxiliary terminal's settings (baud rate, parity, stop bits, and data bits) must be identical with those of the auxiliary device.

Baud Rate, Aux Port

Usage: Can be used to transfer data faster or match an auxiliary device.

Definition: The rate at which the scanner and host transfer data back and forth.

Serial Cmd: *<**K101,**aux port mode,**baud rate**,parity,stop bits,data bits,daisy chain ID status,daisy chain ID>*

Default: **9600**

Options:

0 = 600	3 = 4800	6 = 38.4K
1 = 1200	4 = 9600	7 = 57.6K
2 = 2400	5 = 19.2K	8 = 115.2K

Parity, Aux Port

Usage: Only changed if necessary to match host setting.

Definition: An error detection routine in which one data bit in each character is set to 1 or 0 so that the total number of 1 bits in the data field is even or odd.

Default: **Even**

Options: *<**K101,**aux port mode,baud rate,**parity**,stop bits,data bits,daisy chain ID status,daisy chain ID>*

Serial Cmd: 0 = None 1 = Even 2 = Odd

Stop Bits, Aux Port

Usage: Only changed if necessary to match host setting.

Definition: Allows the user to select the last one or two bits in each character to indicate the end of the character.

Serial Cmd: *<**K101,**aux port mode,baud rate,parity,**stop bits**,data bits,daisy chain ID status,daisy chain ID>*

Default: **One**

Options: 0 = One 1 = Two

Data Bits, Aux Port

Usage: Only changed if necessary to match host setting.

Definition: Number of bits in each character.

Serial Cmd: *<**K101,**aux port mode,baud rate,parity,stop bits,**data bits**,daisy chain ID status,daisy chain ID>*

Default: **Seven**

Options: 0 = Seven 1 = Eight

Auxiliary Port Mode

Definition: Determines the flow of data between the auxiliary port device(s), the scanner, and the host.

Serial Cmd: <**K101,*aux port mode***,*baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID*>

Default: **Disabled**

Options:

0 = Disabled	1 = Transparent
2 = Half duplex	3 = Full duplex
4 = Daisy chain	5 = Command Processing

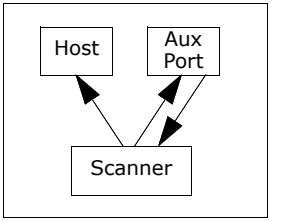
Transparent Mode

Usage: A common application, in conjunction with handheld scanners, is one that employs an auxiliary readout to detect mis-applied bar code symbols.

Definition: In **Transparent** mode data is passed between the auxiliary port and the host. The scanner buffers data from the auxiliary port and echoes the keyed data on the auxiliary port.

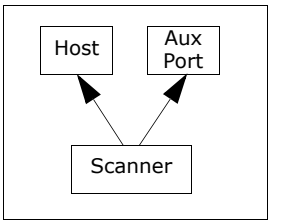
Data initiated from the Auxiliary Port

- Auxiliary port data is passed through to the host whenever a return key is pressed at the auxiliary port or symbol data is sent.
- Whenever aux port data is sent with symbol data, the aux port data will appear between the preamble and the symbol data.
- Auxiliary port data to the host is always sent with a preamble and a postamble.
- If the scanner is in a polled mode to the host, auxiliary port data will NOT pass through.
- **<D>** is the only command accepted by the scanner from the auxiliary port. All other commands will pass through to the host.



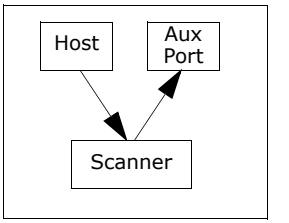
Data initiated from the Scanner

- Transmission to the auxiliary port occurs immediately upon a good read.
- Scan data to the auxiliary port does not include a preamble or a postamble.
- Communications with the auxiliary port is always in Point-to-Point protocol, even if the host is in a polled protocol mode.



Data initiated from the Host

- All host data is echoed to the auxiliary port in unpolled and polled mode.



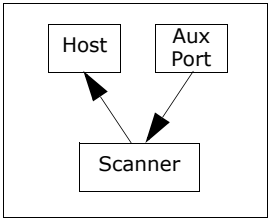
Serial Cmd: *<***K101,*aux port mode*,*baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID>*
1 = Transparent

Half Duplex Mode

Usage: Useful when the user wants symbol data displayed on an auxiliary screen close to the scanner.

Definition: In **Half Duplex** mode all auxiliary port data and symbol data is sent directly to the host. Symbol data is displayed on the auxiliary port screen at the same time the data is sent to the host.

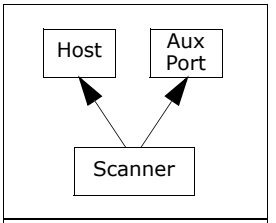
Data initiated from the Auxiliary Port



- Auxiliary port data to the host is ignored if the scanner is in a polled mode.
- Auxiliary port data or scanned data is sent to the host whenever it is received.
- Auxiliary port data is not echoed.
- Auxiliary port data to the host is always sent without a preamble or a postamble.
- **<D>** is the only command that is accepted by the scanner from the auxiliary port. All other commands are passed through to the host.

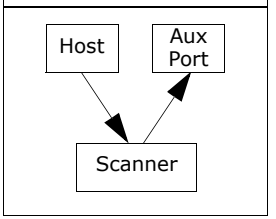
Data initiated from the Scanner

- Scan data is transmitted to the auxiliary port at the same time it is transmitted to the host.
- Data transmission conforms with all parameters specified in the configuration menu (e.g., **Preamble**, **Postamble**, **End of Read Cycle**).



Data is initiated from the Host

- All host data is echoed to the auxiliary port in unpolled mode.



Serial Cmd: *<**K101,aux port mode**,baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID>*

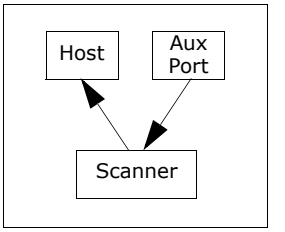
2 = Half Duplex

Full Duplex Mode

Usage: When communication to and from the auxiliary port is required.

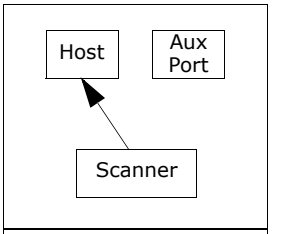
Definition: In **Full Duplex** mode all auxiliary port data and symbol data is sent directly to the host. Symbol data is not displayed on the auxiliary port screen.

Data initiated from the Auxiliary Port



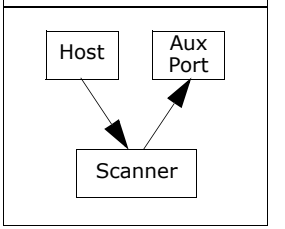
- Auxiliary port data to the host is ignored if the scanner is in a polled mode.
- Auxiliary port data or scanned data is sent to the host whenever it is received.
- Auxiliary port data is not echoed.
- Auxiliary port data to the host is always sent without a preamble or a postamble.
- **<D>** is the only command that is accepted by the scanner from the auxiliary port. All other commands are passed through to the host.

Data initiated from the Scanner



- Scan data is not sent to the auxiliary port.

Data initiated from the Host



- All host data is echoed to the auxiliary port in unpolled mode.

Serial Cmd: *<**K101,aux port mode**,baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID>*

3 = Full duplex

Daisy Chain Mode

Usage: Useful in applications where:

- A symbol might be scanned in both ladder and picket fence directions.
- A symbol may be present on multiple sides of a package.
- Symbols are presented at different depths.

Definition: In a daisy chain application, scanners are connected in tandem or "daisy chain" and decoded data is relayed from one scanner to another on up to the host.

A master scanner has its host port linked to the host computer and its auxiliary port linked to the host port of the first "slave" scanner in the chain. Thereafter, each slave's auxiliary port is linked to the host port of the slave that is further from the host in the daisy chain.

Each scanner in the daisy chain can be assigned an ID that accompanies any data that it sends.

Serial Cmd: <**K101,*aux port mode***,*baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID*>

Options: **4 = Daisy chain**

Function: Before the master scanner times out, it checks its auxiliary port for data. It should be set to wait at least **20** mS for each slave in the daisy chain. (See **"Read Cycle Timeout" on page 4-15**.) If no data is received within the read cycle timeout, the master sends a noread message to the host. Otherwise the complete data is sent.

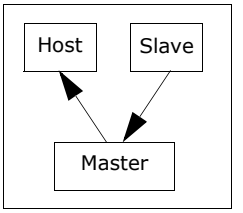
If for example a master scanner is set to timeout in 120 mS, the first slave scanner might be set to 100 mS, the next to 80 mS, and so forth, thus assuring that at least 20 mS elapses between transmissions.[a]

Daisy-chained scanners can send a series of symbols by enabling **Multi-symbol** and a common multisymbol separator. If the master scanner does not receive the expected number of symbols, noread messages are appended to the data string to make up the difference between the number of symbols enabled in **Multisymbol** and the number of symbols read.

For example, a master and two slaves have **Number of Symbols** set to 3 and **Multisymbol Separator** defined as %. If the master and the first slave do not find symbols, but the next slave scanner registers a good read, the transmitted results will be: symbol data % noread % noread.

a. The above example is based on the best case. Other factors such as baud rate, dynamic focus timing, number of characters in a given symbol, and the number of slaves in the daisy chain can affect timing and may need to be included in your calculations for complete accuracy.

Conditions: The conditions for a daisy chain application are as follows:



1. The master scanner's trigger must be **Serial** or **External**; the slave scanners' triggers are configured for **Serial**.
2. All scanners are enabled to **Daisy Chain** mode.
3. Each scanner's auxiliary port must be connected to the Host port of its slave scanner.
4. Each slave scanner in the daisy chain must be set to send its data no less than **20** mS before its preceding scanner.
5. All but the master scanner must have **Postamble** enabled and set to **CR** (^M) only.
6. All but the master scanner must have their noread messages disabled.
7. If **Multisymbol** is enabled, **Multisymbol Separator** characters must match in all scanners and **Number of Symbols** must be set to number large enough to include all the symbols it may itself read plus the number of symbols that it will be expected to relay to the host or the next scanner up the line.
8. **Symbology ID** enable/disable must be the same in all scanners.
9. All but the master scanner must have their diagnostic warning messages disabled.
10. **Daisy Chain ID Status** enable/disable and the number of characters in **Daisy Chain ID** must be the same in all scanners.

Command Processing Mode

Usage: Allows user to send configuration from the Host port or the AUX port.

Definition: When enabled, **Command Processing** allows commands to be entered via the aux port. The following rules apply:

1. Bar code data, including the serial trigger if used, will be transmitted to the last port from which a command was sent.
2. If a reset occurs, all data will be transmitted to the host port.

Serial Cmd: <**K101,*aux port mode***,*baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID*>

Options: **5 = Command Processing**

Daisy Chain ID Status

Usage: Used in a daisy chain setup in cases where the host needs to know which scanner in a daisy chain setup sent the data.

Definition: Each scanner in a daisy chain can be assigned a one or two character ID that will appear in front of decoded data and identify its source.

Serial Cmd: <**K101,***aux port mode,baud rate,parity,stop bits,data bits,***daisy chain ID status***,daisy chain ID>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Note: Enable/disable and length must be the same in all scanners.

Daisy Chain ID

Usage: Used in a daisy chain setup in cases where the host needs to know which scanner sent the data.

Definition: A one or two character prefix which identifies the particular daisy chain scanner from which the data is being sent.

Serial Cmd: <**K101,***aux port mode,baud rate,parity,stop bits,data bits,daisy chain ID status,***daisy chain ID***>*

Default: **1***/*

Options: Any one or two ASCII characters.

Preamble

Preamble Status

Usage:	Useful for identifying and controlling incoming data. For example, defining the **preamble** as a carriage return and a line feed causes each decoded message to be displayed of on its own line.
Definition:	Defines a one to four character data string that can be added to the front of the decoded data.
Serial Cmd:	<**K141,*preamble status***,*preamble character(s)*>
Default:	**Disabled**
Options:	0 = Disabled 1 = Enabled (within any protocol)

Preamble Characters

Serial Cmd:	<**K141,***preamble status*,***preamble characters***>
Default:	**^M** corresponds to: **carriage return / null / null / null**.
Options:	Up to four user-defined ASCII characters, including control characters.

Within a Serial Command.

To enter control characters within a serial command, hold down the control key while typing the desired character.

Example: **<K141,1,CNTL-m>** to enter ^M.

Within an Embedded Menu

Control characters entered on the command line are displayed in the menu as mnemonic characters, such as: <CR><NUL><NUL><NUL>.

To enter a control character from within an embedded menu, first type in a space (with the space key). This has the effect of allowing the control key to be recognized as a part of the control character. Next hold down the control key while typing the desired character.

Example: **Space CNTL-m** to enter **^M.**

Postamble

Postamble Status

Usage: Useful for identifying and controlling incoming data. For example, defining the postamble as a carriage return and a line feed causes each decoded message to be displayed of on its own line.

Definition: Defines a one to four character data string that can be added to the end of the decoded data.

Serial Cmd: <**K142,*status***,*postamble character(s)*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled (within any protocol)

Postamble Characters

Serial Cmd: <**K142,***status*,***postamble characters***>

Default: **^M^J**. Corresponds to carriage return/line feed/null/null, as displayed in the menu.

Options: Up to four user-defined ASCII characters, including control characters.

Within a Serial Command

To enter control characters within a serial command, hold down the control key while typing the desired character.

Example: **<K142,CNTL-m CNTL-j>** to enter ^M^J.

Within an Embedded Menu

Control characters entered on the command line are displayed in the menu as mnemonic characters, such as: <CR><LF><NUL><NUL>

To enter a control character from within an embedded menu, first type in a space (with the space key). This has the effect of allowing the control key to be recognized as a part of the control character. Next hold down the control key while typing the desired character.

Example: **Space CNTL-m Space CNTL-j** to enter ^M^J.

LRC Status

(Longitudinal Redundancy Check)

Usage: Used when extra data integrity is required.

Definition: An error-checking routine that verifies the accuracy of transmissions. It is the exclusive OR of all characters following the **STX** (start of text) up to and including the **ETX** (end of text). What this means is that the binary representation of all the characters in a transmissions are cumulatively added in a column and each resulting odd integer is assigned a 1 and each even integer a 0 (two 1s = 0, two 0s = 0, a 1 and a 0 = 1). The extra **LRC** character is then appended to the transmission and the receiver (usually the host) performs the same addition and compares the results.

Serial Cmd: <**K145,***LRC status*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Intercharacter Delay

Usage: Used only when a host cannot receive data quickly enough and there is enough time between symbols to allow data to be completely transferred. It is rarely used since any setting other than zero will slow down communications. For example, a 200 setting will result in a 1/5 second delay between each character that is transmitted.

Definition: The time interval in milliseconds between individual characters transmitted from the scanner to the host.

Serial Cmd: <**K144,***intercharacter delay*>

Default: **0**

Options: 0 to 255 (in milliseconds). Zero (0) causes no delay between characters.

4 Read Cycle

Contents

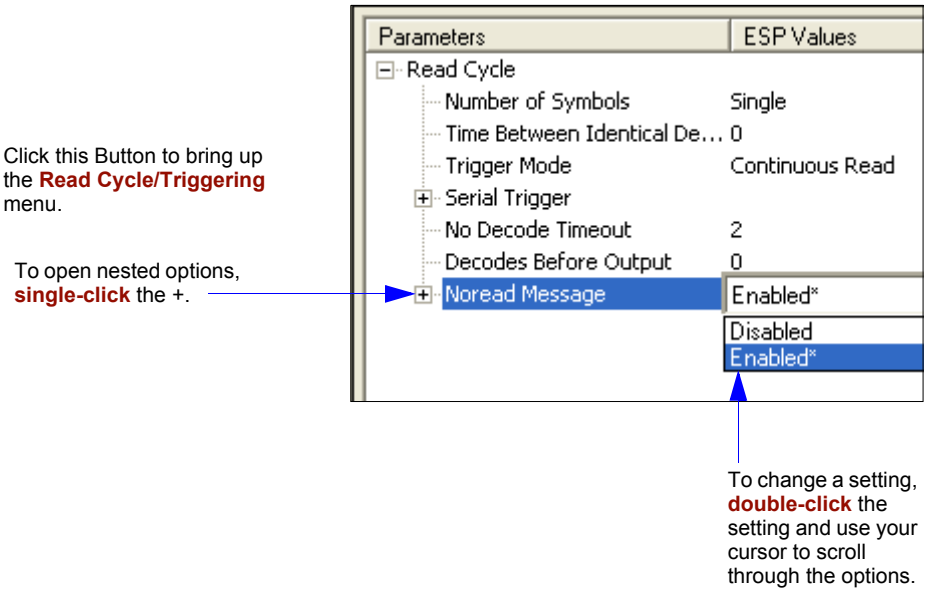
Read Cycle by ESP 4-2
Read Cycle by Serial Command 4-2
Multisymbol 4-3
Number of Symbols 4-4
Trigger 4-6
Serial Trigger 4-12
End of Read Cycle 4-14
Decodes Before Output 4-16
Scanner Setup 4-17
Laser Setup 4-21

After you've established communications and completed basic read rate testing, you will need to address the spatial and timing parameters associated with your application. In a typical operation a bar coded item moves along a line past a scanner. A trigger or timer activates a read cycle during which the scanner actively searches for symbols. You will need to decide how to initiate the read cycle and how and when to end it.

Note: When assigning characters in user-defined fields, the characters **NULL <>** and **,** can only be entered through embedded menus, not through **ESP** or serial commands.

Note: You can learn the current setting of any parameter by inserting a question mark after the number, as in **<K100?>**. To see all "**K**" commands, send **<K?>**.

Read Cycle by ESP



Read Cycle by Serial Command

Command Title	Format
Multisymbol	<**K222,***number of symbols,multisymbol separator*>
Trigger Mode	<**K200,***trigger mode,trigger filter duration*>
External Trigger State	<**K202,***external trigger state*>
Serial Trigger Character	<**K201,***serial trigger character*>
Start Serial Trigger Character	<**K229,***start trigger character*>
End Serial Trigger Character	<**K230,***end trigger character*>
End of Read Cycle	<**K220,***end of read cycle,read cycle timeout*>
Decodes Before Output	<**K221,***number before output,decodes before output mode*>
Automatic Gain Control	<**K504,** gain level,AGC sampling mode,AGC min,AGC max>
Scan Speed	<**K500,***scan speed*>
Symbol Detect/Transition	<**K505,***symbol detect status,transition counter*>
Maximum Element	<**K502,**maximum element>
Scan Width Enhance	<**K511,***scan width enhance*>
Laser Controls	<**K700,***laser on/off status,laser framing status,laser on position, laser off position,laser power*>

Multisymbol

Usage: Commonly used in shipping applications where a shipping symbol contains individual symbols for part number, quantity, etc. This feature allows one trigger to pick up all the symbols. AIAG and UCC/EAN-128 are two application standards that address this need.

Definition: Allows the user to set up conditions that will allow more than one symbol to be decoded and output.

Conditions The following conditions apply:

1. All noread messages are posted at the end of the data string.
2. If more than one symbol is within the scan beam at the same time, symbol data may not be displayed in the order of appearance.
3. If **Matchcode Type** is set to **Sequential** or if **Trigger** is set to **Continuous Read 1 Output**, **Number of Symbols** will default to **1** (if set to any number greater than 1).
4. The maximum number of characters in any one bar code (other than PDF417) is **64**.
5. The maximum number of characters in a single scan line is **102** (Code 39).
6. The maximum number of characters for all symbols is **392**, including preamble, separators, and LRC.

Number of Symbols

Definition: **Number of Symbols** allows the user to define up to 6 symbols that can be read in a single read cycle.

Serial Cmd: <**K222,*number of symbols***,*multisymbol separator*>

Default: **1**

Options 1 to 6

Multisymbol Separator

Usage:	Used to delimit or separate data fields with a user defined character.
Definition:	The character that's inserted between each symbol scanned when **Multi-symbol** is set to any number greater than **1**.
ESP:	To select a new multisymbol separator, double-click on **Separator** and select a character in the popup window.
Serial Cmd:	<**K222,***number of symbols*,***multisymbol separator***> **Note**: If **Multisymbol Separator** has been changed to any character other than the default comma and you wish to re-define the separator as a comma, use **ESP** or the embedded menu.
Default:	**,** (comma)
Options:	Any available ASCII character, except **< > NUL**.

Trigger

Trigger Mode

Definition: The type of trigger event that will initiate the read cycle.

Serial Cmd: <**K200,*trigger mode,***trigger filter duration*>*

Default: **Continuous Read**

Options:

0 = Continuous Read	3 = External Edge
1 = Continuous Read 1 Output	4 = Serial Data
2 = External Level	5 = Serial Data & External Edge

Continuous Read

Usage: **Continuous Read** is useful in testing symbol readability or scanner functions. It is not recommended for normal operations.

Definition: In **Continuous Read**, trigger input options are disabled, the scanner is always in the read cycle, and it will attempt to decode and output every scan crossing a symbol.**When To Output** and **Noread** options have no affect on **Continuous Read**.

Serial Cmd: <**K200,*0***>

Continuous Read 1 Output

Usage: **Continuous Read 1 Output** can be useful in applications where it is not feasible to use a trigger and all succeeding symbols contain different information. It is also effective in applications where the objects are hand-presented.

Definition: In **Continuous Read 1 Output** the scanner self-triggers whenever it decodes a new symbol or a timeout occurs.

If **End Of Read Cycle** is set to **Timeout** and the symbol doesn't change, the scanner will repeat the output at the end of each timeout period. For example, if **Timeout** is set to one second, the scanner sends the symbol data immediately and repeats the output at intervals of one second for as long as the symbol continues to be scanned.

If **End Of Read Cycle** is set to **New Trigger**, the scanner will send the current symbol data immediately, but send it only once. A new symbol appearing in the scanner's range will be read and sent immediately provided it is not identical to the previous symbol read.

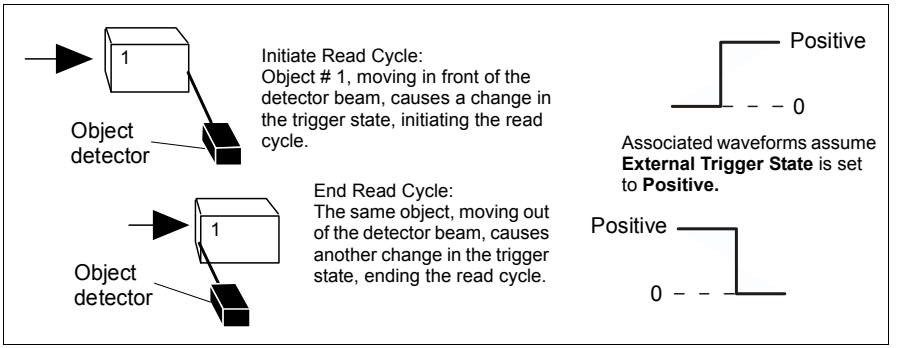
Serial Cmd: <**K200,*1***>

Caution: In automated environments, **Continuous Read 1 Output** is not recommended because there is no one to verify that a symbol was missed.

Note: If **Trigger** is set to **Continuous Read 1 Output**, **Number of Symbols** will default back to **1** (if set to any number greater than 1).

External Trigger Level

Usage: This mode is effective in an application where the speeds of the conveying apparatus are variable and the time the scanner spends scanning each object is not predictable. It also allows the user to determine if a noread has occurred.


1
Object detector
Initiate Read Cycle:
Object # 1, moving in front of the detector beam, causes a change in the trigger state, initiating the read cycle.
Positive
0
Associated waveforms assume **External Trigger State** is set to **Positive.**
End Read Cycle:
The same object, moving out of the detector beam, causes another change in the trigger state, ending the read cycle.
1
Object detector
Positive
0

Trigger Level

Definition: **External Level** allows the read cycle to begin when a trigger (change of state) from an external sensing device is received. The read cycle endures until the object moves out of the sensor range and the active trigger state changes again.

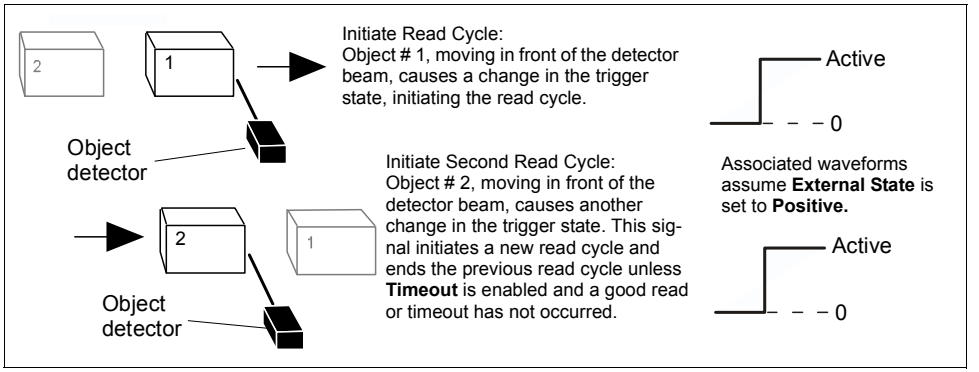
Serial Cmd: <**K200,2**>

Important: Level and **Edge** apply to the active logic state (**Positive** or **Negative**) that exists while the object is in a read cycle, between the rising edge and falling edge. *Rising edge* is the trigger signal associated with the appearance of an object. *Falling edge* is the trigger signal associated with the subsequent disappearance of the object.

External Trigger Edge

Usage: This mode is highly recommended in any application where conveying speed is constant or if spacing, object size, or timeouts are consistent.

Definition: **External Trigger Edge**, as with Level, allows the read cycle to begin when a trigger (change of state) from an external sensing device is received. However, the passing of an object out of sensor range does not end the read cycle. The read cycle ends with a good read output or, depending on **End of Read Cycle** setting, a timeout or new trigger occurs.


2
1
Object detector
Initiate Read Cycle:
Object # 1, moving in front of the detector beam, causes a change in the trigger state, initiating the read cycle.
Active
0
Initiate Second Read Cycle:
Object # 2, moving in front of the detector beam, causes another change in the trigger state. This signal initiates a new read cycle and ends the previous read cycle unless **Timeout** is enabled and a good read or timeout has not occurred.
Associated waveforms assume **External State** is set to **Positive.**
2
1
Object detector
Active
0

Trigger Edge

Serial Cmd: <**K200,3**>

Important: Level and **Edge** apply to the active logic state (**Positive** or **Negative**) that exists while the object is in a read cycle, between the rising edge and falling edge. *Rising edge* is the trigger signal associated with the appearance of an object. *Falling edge* is the trigger signal associated with the subsequent disappearance of the object.

Important: Level and **Edge** apply to the active logic state (**Positive** or **Negative**) that exists while the object is in a read cycle, between the rising edge and falling edge. *Rising edge* is the trigger signal associated with the appearance of an object. *Falling edge* is the trigger signal associated with the subsequent disappearance of the object.

Serial Data

Usage: Highly recommended in any application where conveying speed is constant or if spacing, object size, or timeouts are consistent.

Definition: In **Serial Data**, the scanner accepts an ASCII character from the host or controlling device as a trigger to start a read cycle. A **Serial Data** trigger behaves the same as an **External Edge** trigger.

Serial Cmd: <**K200,*4***>

Serial Data or External Edge

Usage: **Serial Data or External Edge** is seldom used but can be useful in an application that primarily uses an external sensing device but occasionally needs to be manually triggered. An auxiliary terminal can be connected to the aux port so the user can send the serial trigger character through the scanner to the host.

Definition: In this mode the scanner accepts either a serial ASCII character or an external trigger pulse to start the read cycle.

Serial Cmd: <**K200,*5***>

Trigger Filter Duration

Usage: **Trigger Filter Duration** is useful where trigger bounce could cause false triggers.

Definition: **Trigger Filter Duration** can prevent trigger bounce from falsely triggering the scanner by limiting the time in which trigger pulses can be received.

Serial Cmd: <**K200,***trigger mode*,***trigger filter duration***>

Default: **244** (0.0099796 seconds)

Options: 0.0000818 to 2.6803815 seconds

External Trigger State

Note: External Level, **External Edge**, or **Serial Data or Edge** trigger mode must be enabled for **External Trigger** to take effect.

Usage: Users can select the trigger polarity that will operate with their systems.

Definition: Determines whether a positive or negative transition will initiate the read cycle.

Serial Cmd: <**K202,*external trigger state***>

Default: **Positive**

Options: 0 = Negative 1 = Positive

Serial Trigger

Usage: Allows the user to define the trigger character that initiates the read cycle.

Definition: An on-line host command composed of a single ASCII host serial trigger character that initiates or ends the read cycle.

Trigger characters are of two types: delimited and non-delimited. A delimited character is entered within angle brackets delimiters < >.

A non-delimited trigger character is one that either starts or ends the read cycle and is NOT enclosed by delimiters such as < >.

Serial Trigger Character

Usage: Useful in applications where a single serial character enclosed in angle brackets initiates the read cycle.

Definition: A trigger character is one that starts the read cycle, is enclosed by delimiters < > and can only be sent when the trigger mode is set to **Serial Data** or **Serial Data & Edge**.

Serial Cmd: <**K201,*serial trigger character***>

Default: **GS** (corresponds to ^] displayed in the embedded menu)

Options: A single ASCII character, including control characters.

Note: The following characters cannot be used as serial trigger characters: NUL (0x00), an existing host command character, or an online protocol character.

Note: **Serial Data** or **Serial Data & Edge** triggering mode must be enabled for Serial Trigger Character to take effect.

Non-delimited Start and Stop Characters

Note: If the serial trigger is set to an existing command, it will override the command. The command will no longer be valid. For example, if the serial trigger is **<Z>**, parameters will no longer be saved, but when the save command is sent (**<Z>**), the scanner will trigger.

Note: In multidrop and user-defined protocols, the start and stop characters must be delimited.

Both **Start** and **Stop** non-delimited characters can be defined and will function according to the trigger event, as follows:

When defining **Start** and **Stop** trigger characters, the following rules apply:

- In **External Edge** the scanner looks only for the **Start Trigger Character** and ignores any **Stop Trigger Character** that may be defined.
- In **External Level**, the **Start Trigger Character** begins the read cycle and **Stop Trigger Character** ends it. Note that even after a symbol has been decoded and the symbol data transmitted, the scanner remains in **External Level** trigger read cycle until a **Stop** character is received.
- In **Serial Data & Edge** trigger mode, either a **Start Trigger Character** or a hardware trigger can start an **Edge** trigger read cycle.

Start Character (non-delimited)

Usage:	It is useful in applications where different characters are required to start and end a read cycle.
Definition:	A single ASCII host serial trigger character that starts the read cycle and is not enclosed by delimiters such as < and >.
Serial Cmd:	<**K229,*start trigger character***>
Default:	**Null** (disabled)
Options:	Two hex digits representing an ASCII character except <, >, XON and XOFF.

Stop Character (non-delimited)

Usage:	It is useful in applications where different characters are required to start and end a read cycle.
Definition:	A single ASCII host serial trigger character that ends the read cycle and is not enclosed by delimiters such as < and >.
Serial Cmd:	<**K230,*stop trigger character***>
Default:	**Null** (disabled)
Options:	Two hex digits representing an ASCII character except <, >, XON and XOFF.

See Appendix E, **"ASCII Table"**, for ASCII character information.

End of Read Cycle

Note: **When to Output** must be set to **End of Read Cycle** before this command can be active.

Definition: The read cycle is the time during which the scanner will attempt to read and decode a symbol. At the end of a read cycle the scanner stops reading symbols and sends the symbol data or noread message to the host.

End of Read Cycle Mode

Definition: A read cycle can be terminated by a new trigger, a timeout, or a combination of both.

Serial Cmd: <**K220,*end of read cycle***,*read cycle timeout*>

Options: 0 = Timeout

1 = New Trigger

2 = Timeout & New Trigger

Note: When operating in **Continuous Read** or **Continuous Read 1 Output**, the scanner is always in the read cycle.

Timeout

Usage: Typically used with **Serial** or **Edge** and **Continuous One**.

It is effective in highly controlled applications when the maximum length of time between objects can be predicted. It assures that a read cycle ends before the next bar coded object appears, giving the system extra time to decode and transmit the data to the host.

Definition: **Timeout** ends the read cycle when the time set in **Read Cycle Timeout** elapses or “times out.”

If in **Continuous Read 1 Output**, a timeout initiates a new read cycle and allows the same symbol to be read again.

With either **External Edge**, **Serial Data**, or **Serial Data & Edge** enabled, a timeout ends the read cycle and symbol data or a noread message is sent to the host.

With **External Level** enabled, the read cycle does not end until the falling edge trigger or a timeout occurs. The next read cycle does not begin until the next rising edge trigger.

New Trigger

Usage: **New Trigger** is an effective way to end a read cycle when objects move past the scanner at irregular intervals (not timing dependent).

Definition: **New Trigger** ends the current read cycle and initiates a new one when a new trigger occurs. **New Trigger** refers only to a “rising edge” trigger.

With either **External Edge**, **Serial**, or **Serial or Edge** enabled, an edge or serial trigger ends a read cycle and initiates the next read cycle.

In the case of **External Level**, a falling edge trigger ends the read cycle but the next read cycle does not begin until the occurrence of the next rising edge trigger.

Note: When **New Trigger** is enabled and if not in **External Level** mode, **Laser On/Off** will have no effect. When noreads occur, the laser will remain on.

Timeout or New Trigger

Usage: Useful in applications that require an alternative way to end the read cycle. For example, if an assembly line should stop completely or the intervals between objects are highly irregular.

Definition: **Timeout or New Trigger** is identical to **Timeout**, except that a timeout *or* a new trigger (whichever occurs first) ends the read cycle.

Read Cycle Timeout

Usage: It is useful in many tightly controlled applications which require a read cycle to end before the next object appears and therefore need the flexibility of a timeout adjustment.

Definition: **Read Cycle Timeout** is the time span of the read cycle and is represented in 10 mS increments. It is used in conjunction with **External Edge** or **Serial Trigger.**

Serial Cmd: <**K220,***end of read cycle*,***read cycle timeout***>

Default: **100** (Corresponds to one second or 1000 mS.)

Options: 0 to 65535. (Divide any positive number entered by 100 to determine the time in seconds.)

Timeout does not function when in **Continuous** or **Level** read cycle modes.

Continuous 1: The scanner will only read a given symbol once until a timeout occurs or a different symbol is presented.

Note: A minimum setting of **2** is recommended.

Note: **Timeout** or **Timeout or New Trigger** under **End of Read Cycle** must be enabled for **Read Cycle Timeout** to take effect.

Decodes Before Output

Note: When setting up, determine if the scanner's scan rate is capable of scanning your longest symbol the required number of times.

Decodes Before Output Mode

Usage: Useful when the highest level of reliability is required.

Definition: When consecutive is enabled, the number set in **Decodes Before Output** must be achieved consecutively before decoded data is sent. For example, if set to **Number Before Output** is set to 5, then the data will be output whenever five decodes occur in succession.

When the default non-consecutive is set, whenever a cumulative number of decodes is achieved, decoded data is sent. For example, if non-consecutive is enabled and **Decodes Before Output** is set to 10, then data will be sent when the total number of decodes reaches 10 regardless of the number of bad reads between decodes.

Serial Cmd: <**K221,***number before output,***decodes before output mode***>

Default: **Non-consecutive**

Options: 0 = Non-consecutive 1 = Consecutive

Number Before Output

Usage: This is a very useful feature to increase reliability of reads for symbologies that do not have internal error checking such as Pharmacode.

Definition: The number of decodes required per symbol before a symbol's decoded data is sent. It requires the scanner to successfully decode a symbol a designated number of times before it is sent. If it doesn't achieve the number of good reads during the read cycle, then a noread will be sent.

Note: Higher settings will decrease throughput speed.

Serial Cmd: <**K221,*****number before output,***decodes before output mode***>

Default: **1**

Options: 1 to 255

Scanner Setup

Scanner Setup includes **Gain**, **Scan Speed**, **Laser Power**, and **AGC**.

Gain Level

Usage: Can be useful for fine-tuning gain or when portions of analog signals spike, as in the case of specular reflection or extraneous noise.

Definition: Sets a voltage amplitude value for the analog circuitry.

Serial Cmd: <**K504,*gain level*,***AGC sampling,AGC min,AGC max***>*

Default: **90** (high density scanner) or **110** (low density scanner)**.**

Note: **Gain Level** is optimized at the factory before shipment; the default value may not be 90.

Options: 40 to 255

Scan Speed

Usage: To ensure a minimum number of scans, faster scan speeds are typically used for fast moving symbols and/or longer symbols with larger bar widths. See **“Formulas for Number of Decodes” on page A-27**.

Note: Scan beams move faster across symbols further out in the scan range since the moving beam is being projected from a spinning mirror.

Definition: Allows the user to set the number of scans per second by controlling the spinning mirror motor speed.

Serial Cmd: <**K500,*scan speed***>

Default: **50** (x 10) Low density scanner

35 (x 10) High density scanner

Options: 300 to 1000

Laser Power

Usage: Used to optimize read performance at different distances. Typically higher power is used at greater distances.

Definition: Allows the user or calibration routine to select laser power setting.

Serial Cmd: <**K700,***laser on/off status,laser framing status,laser on position,laser off position,****laser power***>*

Default: **High** Power (Low density scanner)
Medium Power (High density scanner)

Options: 0 = Low 1 = Medium 2 = High

Automatic Gain Control (AGC)

AGC Sampling Mode

Usage: **AGC Sampling** allows you to specify how automatic gain control sampling will be done.

Definition: AGC is the acronym for Automatic Gain Control. AGC increases the depth of field by attempting to maintain signal strength at a constant level regardless of the range of the bar code symbol.

Serial Cmd: <**K504,***gain level,****AGC sampling mode****,AGC min,AGC max>*

Default: **Continuous**

Options: 0 = Disabled 1 = Leading Edge 2 = Continuous

Disabled

Usage: **Disabled** is not recommended, but can be useful in certain applications in which symbols do not require a large depth of field.

Definition: When **AGC Sampling** is set to **Disabled**, gain levels can only be manually controlled by the **Gain** command.

Leading Edge

Usage: **Leading Edge** is rarely used, but in some cases can improve scan rates when symbols are skewed and the leading edge of a symbol is difficult to locate.

Definition: Finds the leading edge of a symbol by looking for a 40µS quiet zone followed by the number of transitions set in **"Transition Counter"** (page 4-20), stores the highest value of the samples, and adjusts the AGC accordingly at the end of the scan.

Continuous

Usage: **Continuous** is the default and the preferred mode for sampling analog signal amplitude.

Definition: Samples AGC throughout the scan at the rate set in **"Transition Counter"** on page 4-20, averages the sample values, and adjusts the AGC value at the end of the scan.

AGC Minimum

(Read Only)

Definition: Limits the minimum range of the available gain.

Serial Cmd: <**K504,***gain level,AGC sampling mode,***AGC min**,*AGC max*>

Send **<K504?>** for a readout.

Default: **70**

Options 40 to 250

AGC Maximum

(Read Only)

Definition: Limits the maximum range of the available gain.

Serial Cmd: <**K504,***gain level,AGC sampling mode,AGC min,***AGC max**>

Send **<K504?>** for a readout.

Default: **245f**

Options 60 to 255

Symbol Detect Status

Definition: During the read cycle, the scanner counts the number of bar and space transitions defined in the **Transition Counter**. If the count matches or exceeds the threshold, the scanner will perform AGC routines. When enabled, a bad symbol or no symbol message can be output rather than a noread message.

Serial Cmd: <**K505,*****symbol detect status***,*transition counter*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Transition Counter

Usage: Can be useful in certain application where extraneous objects in the field of view might require a higher threshold.

Definition: Determines the number of bar/space transitions that are sampled before AGC can be resolved.

Definition: Determines the number of bar/space transitions that must be read before a symbol is considered present and AGC can be resolved.

Serial Cmd: <**K505,***symbol detect status*,***transition counter***>

Default: **14**

Options: 0 to 255

Note: **Transition Counter** is used for both AGC and symbol detection routines (see **"No Symbol Message"** on page 6-10.

Maximum Element

Usage: **Caution**: Do not change this parameter unless instructed by a your technical representative.

Definition: Maximum Element represents the maximum bar element width, as measured in micro seconds, that's allowed before a video reset occurs (default to white).

Serial Cmd: <**K502,*maximum element***>

Default: **1500** (45.75µS)

Options: 1 to 65535 (.035µS to 2294µS increments)

Scan Width Enhance

Usage: This option should be enabled if large portions of scan width are needed. For example, if a large character count symbol is used to the edge of the scan or is using 70-80% of total scan width.

Definition: **Scan width Enhance** tends to trade depth for width.

Disable if outside edge/long range performance is needed.

Serial Cmd: <**K511,*scan width enhance***>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

Laser Setup

Laser Setup includes **Laser On/Off** and **Laser Framing**.

Note: See also **Auto Frame** on page 9-6 for more details on laser framing.

Laser On/Off Status

Usage: **Laser On/Off** extends the life of the laser. It is useful where there are significant time gaps between symbols. It also provides visual confirmation of a read cycle timeout and minimizes laser exposure to people.

Definition: When enabled, the laser is ON only during the read cycle. When disabled, the laser operates continuously.

Serial Cmd: <**K700,*laser on/off status***,*laser framing status,laser on position,laser off position,laser power*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Laser Framing Status

Usage: Useful in avoiding highly reflective objects, for filtering out unwanted signals, or avoiding the wrong symbols.

Definition: When **Laser Framing** is disabled, the laser is ON for 100 percent of the full scan. When enabled, the extent of the laser arc is determined by the **Laser On Position** and **Laser Off Position** settings.

Serial Cmd: <**K700,***laser on/off status,****laser framing status***,laser on position,laser off position,laser power*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

To adjust laser framing automatically, click the **Calibration** button and click the **Auto Frame** button.

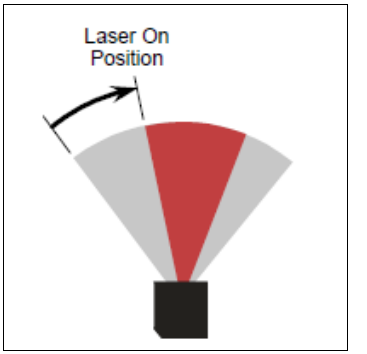
Note: Because scan widths are not always perfectly symmetrical, the most effective way to setup laser framing is to experiment with the **Laser On Position** and **Laser Off Position** commands until you get the best results.

Laser On Position

Definition: Percentage of the full scan arc that the scan beam moves through before the laser turns ON. For example, if set for 30, the laser will be off during the first 30 percent of the scan.

When **Laser Framing** is disabled, the laser is ON for 100 percent of the full scan.

When **Laser Framing** is enabled, the laser turns ON at the specified percentage of the scan.



Laser On Position

Serial Cmd: *<**K700,**laser on/off status,laser framing status,**laser on position**,laser off position,laser power>*

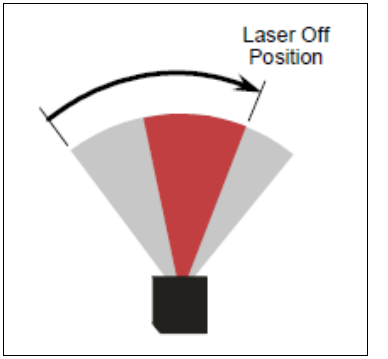
Default: **10**

Options: 10 to 80

Laser Off Position

Definition: Percentage of the full scan arc that the scan beam moves through before the laser turns OFF.

Note: Laser Off Position must always exceed the value of **Laser On Position** for an actual scan to take place.



Laser Off Position

Serial Cmd: *<**K700,**laser on/off status,laser framing status,laser on position,**laser off position**,laser power>*

Default: **95**

Options: 20 to 95

Laser Power

Definition: This parameter allows the user to select a laser power setting as follows:

Serial Cmd: <**K700,***laser on/off status,laser framing status,laser on position,laser off position,****laser power***>*

Default: **High**

Options: 0 = Low (~0.6mW)

1 = Medium (~1.0mW)

2 = High (~1.5mW)

Chapter 5 Symbologies

Chapter Contents

Symbology by Serial Command 5-2
Code 39 5-3
Code 128 5-6
Interleaved 2 of 5 5-13
Codabar 5-17
Code 93 5-24
Narrow Margins 5-27
Symbology ID 5-28
Background Color 5-29
Autodiscriminate 5-29

This section describes the various symbol types that can be read and decoded by the reader.

Code 39 is enabled by default. To enable all codes, send a **<P>** serial command to the scanner from the Terminal window.[1]

See ***http://www.aimusa.org/standards/aimpubs.htm*** for additional information about symbologies.

Note: When assigning characters in user-defined fields, the characters **NULL < >** and **,** can only be entered through embedded menus, not through ESP or serial commands.

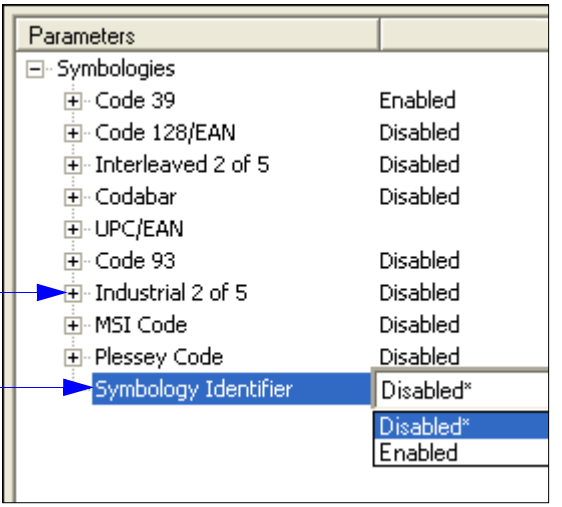
1. If using an I 2/5 symbol, verify that the number of characters in the symbol being scanned matches the code length enabled for the I 2/5 symbol type (default is 10 and 6).

Symbologies by ESP

Click this button to bring up the **Symbologies** menu.

To open nested options, **single-click** the +.

To change a setting, **double-click** the setting and use your cursor to scroll through the options.



Symbologies by Serial Command

Command Title	Format
Code 39	<**K470,***status,check digit status,check digit output,large intercharacter gap,fixed symbol length status,symbol length,full ASCII set*>
Code 128	<**K474,***status,fixed symbol length status,symbol length,EAN-128 status,output format,application record separator status,application record separator character,application record brackets,application record padding*>
Interleaved 2 of 5	<**K472,***status,check digit status,check digit output status,symbol length #1,symbol length #2,unused,range mode*>
Codabar	<**K471,***status,start & stop match status,start & stop output status,large intercharacter gap,fixed symbol length status,fixed symbol length,check digit type,check digit output status*>
UPC/EAN	<**K473,***UPCstatus,EAN status,supplementals status,separator status,separator character,unused,UPC-E output as UPC-A*>
Code 93	<**K475,***status,fixed symbol length status,symbol length*>
Pharmacode	<**K477,***status,fixed bar length status,fixed bar length,min. no. of bars,bar widths,direction,fixed threshold value*>
Narrow Margins/ Symbology ID	<**K450,***narrow margins status,symbology ID status*>
Background Color	<**K451,***background color*>

Code 39

Usage: **Code 39** is considered the standard for non-retail bar code applications.

Definition: An alphanumeric symbol with unique start/stop symbol patterns, composed of 9 black and white elements per character, of which 3 are wide.

Code 39 Status

Serial Cmd: <**K470,*status***,*check digit status,check digit output,large intercharacter gap,fixed symbol length status,symbol length,full ASCII set*>

Default: **Enabled**

Note: This is the only symbol type enabled by default.

Options: 0 = Disabled 1 = Enabled

Check Digit Status (Code 39)

Serial Cmd: <**K470,***code 39 status,**check digit status**,check digit output,large intercharacter gap,fixed symbol length status,symbol length,full ASCII set*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Check Digit Output (Code 39)

Usage: **Check Digit Output Status**, added to the symbol, provides additional security.

Definition: When enabled, the check digit character is read and sent along with the symbol data. When disabled, symbol data is sent without the check digit.

Note: With **Check Digit Output Status** and an **External** or **Serial** trigger option enabled, an invalid check digit calculation will cause a noread message to be transmitted at the end of the read cycle.

Serial Cmd: <**K470,***status,check digit status*,**check digit output**,*large intercharacter gap,fixed symbol length status,symbol length,full ASCII set*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Large Intercharacter Gap (Code 39)

Usage: **Large Intercharacter Gap** is helpful for reading symbols that are printed out of specification.

Caution: Do not use **Large Intercharacter Gap** with **Narrow Margins** enabled since a large intercharacter gap (over 3x) could cause a narrow margins (5x) to be interpreted as an intercharacter gap.

Definition: When enabled, the scanner can read symbols with gaps between symbol characters that exceed three times (3x) the narrow element width.

Serial Cmd: <**K470,***status,check digit status,check digit output,***large intercharacter gap***,fixed symbol length status,symbol length,full ASCII set*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Symbol Length Status (Code 39)

Definition: When enabled, the scanner will check the symbol length against the symbol length field. If disabled, any length is considered a valid symbol.

Serial Cmd: <**K470,***status,check digit status,check digit output status,large intercharacter gap,***fixed symbol length status***,symbol length,full ASCII set*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Symbol Length (Code 39)

Usage: **Fixed symbol Length** helps prevent truncations and increases data integrity by ensuring that only one symbol length will be accepted.

Definition: Specifies the exact number of characters that the scanner will recognize (this does not include start and stop and check digit characters). The scanner ignores any symbol not having the specified length.

Serial Cmd: <**K470,***status,check digit status,check digit output,large intercharacter gap,fixed symbol length status,***symbol length***,full ASCII set*>

Default: **10**

Default: 1 to 64

Full ASCII Set (Code 39)

Usage: Must be enabled when reading characters outside the standard character set (0-9, A-Z, etc.)

User must know in advance whether or not to use **Full ASCII Set** option. Since **Full ASCII Set** requires two symbol words to encode one character, it is less efficient.

Definition: Standard Code 39 encodes 43 characters; zero through nine, capital “A” through capital “Z”, minus symbol, plus symbol, forward slash, space, decimal point, dollar sign and percent symbol. When **Full ASCII Set** is enabled, the scanner can read the full ASCII character set, from 0 to 255.

Serial Cmd: <**K470,***status,check digit status,check digit output,large intercharacter gap,fixed symbol length status,symbol length,**full ASCII set*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Code 128

Usage: **Code 128** is useful in applications with tight spots and high security needs.

Definition: A very dense alphanumeric symbology. It encodes all 128 ASCII characters; it is continuous, has variable length, and uses multiple element widths measured edge to edge.

Code 128 Status

Serial Cmd: <**K474,*status***,fixed symbol length status,fixed symbol length,EAN-128 status,output format,application record separator status,application record separator character,application record brackets,application record padding>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Symbol Length Status (Code 128)

Definition: When enabled, the scanner will check the symbol length against the symbol length field. When disabled, any length is considered a valid symbol.

Serial Cmd: *<**K474,**status**,**fixed symbol length status**,fixed symbol length,EAN-128 status,output format,application record separator status,application record separator character,application record brackets,application record padding>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Symbol Length (Code 128)

Usage: **Fixed Symbol Length** helps prevent truncations and increases data integrity by ensuring that only a fixed symbol length will be accepted.

Definition: Specifies a fixed number of characters that the scanner will recognize (this does not include start and stop and check digit characters). The scanner ignores any symbol not having the specified length.

Serial Cmd: <**K474,**status,fixed symbol length status,***fixed symbol length***,EAN-128 status,output format,application record separator status,application record separator character,application record brackets,application record padding>

Default: **10**

Options: 1 to 64

Note: **Fixed Symbol Length Status** must be enabled for **Symbol Length** to take effect.

EAN-128 Status

Note: Code 128 must be **Enabled** for EAN-128 to function.

Usage: Used as a standard for shipping symbols.

Definition: A subset of Code 128, with extended features. (For more information, see **GS1 US** at:

http://www.gs1us.org/gs1us.html

Or see **AIM**, at:

http://www.aimglobal.org/standards/aimpubs.asp.

Serial Cmd: <**K474,**status,fixed symbol length status,fixed symbol length,***EAN-128 status***,output format,application record separator status,application record separator character,application record brackets,application record padding>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled 2 = Required

If set to **Enabled,** symbols can be read with or without a function 1 character in the first position.

If set to **Required,** the symbol must have a function 1 in the first position and conform to EAN format in order to decode the symbol.

Output Format (Code 128)

Usage: **Application Record** is useful in applications in which the software can utilize application record formatting to help automate the processing of its EAN-128 data.

Definition: Offers an option between **Standard EAN-128** and **Application Record** format.

Serial Cmd: <**K474,**status,fixed symbol length status,fixed symbol length,EAN-128 status,***output format***,application record separator status,application record separator character,application record brackets,application record padding>

Default: **Standard**

Options: 0 = Standard 1 = Application Record

In **Standard** UCC/EAN-128 application identifiers and data fields are sent, but none of the formatting (separators, parentheses, padding) will be included.

Application Record is a variation of UCC/EAN-128 that allows the user to define separators between data fields, enclose application identifiers in parentheses, and enable padding (zeros) for variable length fields.

Note: If an illegal **Application Record** format is detected, the scanner will process it as a noread and output a noread message (if enabled).

Application Record Separator Status (Code 128)

Definition: When enabled, a separator character is inserted between application records.

Serial Cmd: <**K474,***status,fixed symbol length status,fixed symbol length,EAN-128 status,output format,***application record separator status,***application record separator character,application record brackets,application record padding*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Note: **Output Format** must be set to **Application Record** before this parameter can take effect.

Note: When set to **Disable**, app rec sep char is forced to NUL. When set to **Enable**, **Application Record Separator Character** must also be sent in the same command.

Application Record Separator Character (Code 128)

Note: **Application Record Separator Character Status** is enabled by setting the parameter to any value other than a null.

Definition: Allows the user to define an ASCII character as an application record separator.

Serial Cmd: <**K474,***status,fixed symbol length status,fixed symbol length,EAN-128 status,output format,application record separator status,***application record separator character,***application record brackets,application record padding*>

Default: **,** (comma)

Options: User Defined ASCII character

Note: Has no effect unless **Application Record Separator Status** is enabled.

Application Record Brackets (Code 128)

Definition: When enabled, parentheses ( ) are added to enclose application identifiers.

Serial Cmd: <**K474,**status,fixed symbol length status,fixed symbol length,EAN-128 status,output format,application record separator status,application record separator character***,application record brackets***,application record padding>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Note: **Output Format** must be set to **Application Record** before this parameter can take effect.

Application Record Padding (Code 128)

Definition: Padding is the insertion of zeros to make up the maximum length of a variable application record data field, except for the last field which does not require padding.

When enabled, padding is included. When disabled, padding is omitted.

Note: Padding is never added to fixed length fields or to the last data field of a symbol. Enabling or disabling **Record Padding** will have no effect on these.

Serial Cmd: <**K474,***status,fixed symbol length status,fixed symbol length,EAN-128 status,output format,application record separator status,application record separator character,application record brackets,***application record padding*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Note: **Output Format** must be set to **Application Record** before this parameter can take effect.

Interleaved 2 of 5

Usage: It is has been popular because it is the most dense symbol for printing numeric characters less than 10 characters in length; however we do not recommend this symbology for any new applications because of inherent problems such as truncation.

Definition: A dense, continuous, self-checking, numeric symbology. Characters are paired together so that each character has five elements, two wide and three narrow, representing numbers 0 through 9, with the bars representing the first character and the interleaved spaces representing the second character. (A check digit is highly recommended.)

Important: You must set **Symbol Length** in order to decode I 2/5 symbols.

Interleaved 2 of 5 Status

Serial Cmd: <**K472,***status,check digit status,***check digit output status***,symbol length #1,symbol length #2,unused,range mode*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Check Digit Status (Interleaved 2 of 5)

Usage: It is typically not used but can be enabled for additional security in applications where the host requires redundant check digit verification.

Definition: An error correcting routine in which the check digit character is added.

Serial Cmd: <**K472,***status,check digit status,***check digit output status***,symbol length #1,symbol length #2,unused,range mode*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Check Digit Output Status (Interleaved 2 of 5)

Definition: When enabled, a check digit character is sent along with the bar symbol data for added data security.

Serial Cmd: <**K472,***status,check digit status,***check digit output status***,symbol length #1,symbol length #2,unused,range mode*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Symbol Length #1 (Interleaved 2 of 5)

Usage: With Industrial 2/5, two symbol lengths can be defined. When using only one symbol length in an application, setting **Symbol Length #2** to 0 (zero) to ensure data integrity is recommended.

Definition: Specifies a number of characters that the scanner will recognize, including start and stop and check digit characters. The scanner ignores any symbol smaller than the specified length. Because Industrial 2/5 is a continuous symbol, it is prone to substitution errors. Hence, a symbol length must be defined and a bar symbol must contain an even number of digits.**Note**: If start, stop or check digits are used, they are not included in the symbol length count.

Note: If **Range Mode** is set to **Enable**, the settings for **Symbol Length #1** and **Symbol Length #2** will define the range of symbol lengths that can be decoded.

Serial Cmd: <**K472,***status,check digit status,check digit output status,**symbol length #1**,symbol length #2,unused,range mode*>

Default: **10**

Options: 0 to 64

Since I 2/5 characters are paired, symbol length must be set to an even number. If **Check Digit** is enabled, add 2 to your symbol length. For example, if your symbol is 10 characters plus a check digit, then enable **Symbol Length** for 12.

Note: Typically, when printing an I 2/5 symbol with an odd number of digits, a 0 will be added as the first character.

Symbol Length #2 (Interleaved 2 of 5)

Usage: If using a second symbol, a zero or any even symbol length in the option range may be specified. If not using a second symbol, set **Symbol Length #2** to 0 to ensure data integrity.

Definition: Specifies a number of characters that the scanner will recognize, including start and stop and check digit characters. The scanner ignores any symbol smaller than the specified length.

Note: If **Range Mode** is set to **Enable**, the settings for **Symbol Length #1** and **Symbol Length #2** will define the range of symbol lengths that can be decoded.

Serial Cmd: <**K472,***status,check digit status,check digit output status,symbol length #1,***symbol length #2***,unused,range mode*>

Default: **6**

Options: 0 to 64

Since I 2/5 characters are paired, symbol length must be set to an even number. If **Check Digit** is enabled, add 2 to your symbol length. For example, if your symbol is 10 characters plus a check digit, then enable **Symbol Length** for 12.

Note: Typically, when printing an I 2/5 symbol with an odd number of digits, a 0 will be added as the first character.

Range Mode Status (Interleaved 2 of 5)

Usage: Useful in applications where symbol lengths may vary.

Definition: Allows user the option to define a symbol length range for I–2 of 5.

Serial Cmd: <**K472,***status,check digit status,check digit output status,symbol length #1,symbol length #2,unused,***range mode***>

Default: **0**

Options: 0 = Disabled 1 = Enabled

When set to **Enabled**, minimum and maximum symbol lengths will be defined by **Symbol Length #1** and **Symbol Length #2**.

Codabar

Usage: Used in photo-finishing and library applications. Formerly used in some medical applications but not typically used in newer applications.

Definition: Codabar is a 16-character set (0 through 9, and the characters $, :, /, ., +, and –) with start/stop codes and at least two distinctly different bar widths.

Codabar Status

Serial Cmd: <**K471,*status***,*start & stop match status,start & stop output,large intercharacter gap,fixed symbol length status,symbol length,check digit type,check digit output status*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Start & Stop Match Status (Codabar)

Usage: Used to increase security of symbology.

Definition: Requires the Codabar start and stop characters (a, b, c, or d) to match before a valid read can occur.

Serial Cmd: <**K471,***status*,***start & stop match status***,*start & stop output status,large intercharacter gap,fixed symbol length status,symbol length,check digit type,check digit output status*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

Start & Stop Output Status (Codabar)

Usage: Used to verify matching.

Definition: Causes the start and stop characters to be transmitted with symbol data.

Serial Cmd: <**K471,***status,start & stop match status,***start & stop output status***,large intercharacter gap,fixed symbol length status,symbol length,check digit type,check digit status,check digit output status*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

Large Intercharacter Gap (Codabar)

Usage: It is helpful for reading symbols that are printed out of specification.

Caution: Do not use **Large Intercharacter Gap** with **Narrow Margins** enabled since enabling **Large Intercharacter Gap** (over 3x) could cause a narrow margins (5x) to be interpreted as an intercharacter gap.

Definition: Instructs the scanner to read symbols with gaps between characters exceeding three times the narrow element width.

Serial Cmd: <**K471,***status,start & stop match status,start & stop output status,***large intercharacter gap***,fixed symbol length status,symbol length,check digit type,check digit output status*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Symbol Length Status (Codabar)

Usage: Restricting symbol lengths can help prevent truncations and increase data integrity by ensuring that only one or a defined range of symbol lengths will be accepted.

Definition: When set to **Fixed**, the scanner will check the symbol length against the **Symbol Length** field. When set to **Any/Minimum**, any length is considered a valid symbol. The following rules apply:

Serial Cmd: <**K471,***status,start & stop match status,start & stop output status,large intercharacter gap,***fixed symbol length status***,symbol length,check digit type,check digit output status*>

Default: **Any/Minimum**

Options: 0 = Disabled 1 = Enabled

Symbol Length (Codabar)

Definition: Specifies the exact number of characters that the scanner will recognize (this does not include start and stop and check digit characters). The scanner ignores any symbol not having the specified length.

Serial Cmd: <**K471,***status,start & stop match status,start & stop output status,large intercharacter gap,fixed symbol length status,***symbol length***,check digit type,check digit status,check digit output status*>

Default: **10**

Options: 1 to 64

Note: **Fixed Symbol Length Status** must be enabled for **Symbol Length** to take effect.

Note: Because of symbology limitations, setting **Symbol Length** to any number less than four will produce undetermined results.

Check Digit Status (Codabar)

Usage: Modulus 16 is used in the photo-finishing market.NW7 is used in Japanese markets.

Definition: Allows the user to select the check digit type **Codabar** will use.

Serial Cmd: <**K471,***status,start & stop match,start & stop output status,large intercharacter gap,fixed symbol length status,fixed symbol length,***check digit type***,check digit status,check digit output status*>

Default: **Disabled**

Options:

0 = Disabled	2 = NW 7
1 = Modulus 16	3 = Both

Check Digit Output Status (Codabar)

Usage: For additional security a check digit can be added to the symbol.

Definition: When enabled, the check digit character is sent along with the symbol data. When disabled, symbol data is sent without the check digit.

Serial Cmd: <**K471,***status,start & stop match,start & stop output status,large intercharacter gap,fixed symbol length status,symbol length,check digit type,***check digit output status***>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

UPC/EAN

Usage: Used primarily in POS application in the retail industry. It is commonly used in applications in combination with **Matchcode** when there is a need to verify that the right product is being placed in the right packaging.

Definition: UPC (Universal Product Code) is a fixed length numeric, continuous symbology. UPC can have two- or five-digit supplemental symbol data following the normal code. The U.P.C., Version A (U.P.C., A) symbol is used to encode a 12 digit number. The first digit is the number system character, the next five are the manufacturer number, the next five are the product number, and the last digit is the checksum character.

When enabled, the scanner will read UPC version A and UPC version E only.

UPC Status

Serial Cmd: *<**K473,UPC status**,EAN status,supplementals status,separator status,separator character,unused,UPC-E output as UPC-A>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

EAN Status

Usage: **EAN** is the European version of the UPC symbology and is used in European market applications.

Definition: EAN is a subset of UPC. When enabled, the scanner will read UPC version A, UPC version E, EAN 13, and EAN 8. It also appends a leading zero to UPC version A symbol information and transmits 13 digits. If transmitting 13 digits when reading UPC version A symbols is not desired, disable **EAN**.

Note: The extra character identifies the country of origin.

Serial Cmd: *<**K473,**UPC status,**EAN status**,supplementals status,separator status,separator character,unused,UPC-E output as UPC-A>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Supplementals Status (UPC/EAN)

Usage: Reads **Supplementals** typically used in publications and documentation.

Definition: A supplemental is a 2 or 5 digit symbol appended to the main symbol. When set to **Enabled** or **Required**, the scanner reads supplemental symbol data that has been appended to the standard UPC or EAN codes.

Serial Cmd: <**K473,***UPC status,EAN status,**supplementals status**,separator status,separator character,unused,UPC-E output as UPC-A*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled 2 = Required

Disabled

UPC **Supplementals** will not be decoded.

Enabled

When enabled, the scanner will try to decode a main and a supplemental. However, if a supplemental is not decoded, at the end of the read cycle, the main will be sent by itself. The UPC main and supplemental symbols are considered to be one symbol and will be treated as such.

Required

When set to **Required** and either the main or supplemental symbol is not read, a single noread condition results. The UPC main and supplemental symbols are treated as one symbol.

For example, if **Supplementals** is set to **Required**, **Separator** is enabled, and an asterisk is defined as the UPC separator character, then the data will be displayed as: MAIN * SUPPLEMENTAL.

Note: Under no circumstances will supplemental symbol data be sent without a main symbol.

Note: If additional symbols—other than the main or supplemental—will be read in the same read cycle, **Number of symbols** should be set accordingly.

Separator Status (UPC/EAN)

Note: **UPC** must be enabled for **EAN** to take effect.

Usage: Allows user to distinguish between the main and **Supplemental** symbols.

Definition: Allows the user to insert a character between the standard UPC or EAN symbol and the supplemental symbol when **Supplementals** is set to **Enabled** or **Required**.

Serial Cmd: <**K473,***UPC status,EAN status,supplementals status,**separator status**,separator character,unused,UPC-E output as UPC-A*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Separator Character (UPC/EAN)

Note: If **Separator Character** has been changed to any other character and you wish to re-define the separator as a comma, you will need to use **ESP** or the embedded menu.

Usage: As required by the application.

Definition: Allows the user to change the separator character from a comma to a new character.

Serial Cmd: <**K473,***UPC status,EAN status,supplementals status,separator status,***separator character***,unused,UPC-E output as UPC-A*>

Default: **,** (**comma**)

Options: Any ASCII character

Note: Whenever **Separator Character** is defined as a comma (,) sending a <**K473,s?**> command will return the current settings including the separator character comma which appears after the separator status comma.

UPC-E Output to UPC-A (UPC/EAN)

Usage: Useful for applications that require UPC-A output.

Definition: Allows the user to change the output from UPC-E to UPC-A.

Serial Cmd: <**K473,***UPC status,EAN status,supplementals status,separator status,separator character,unused,***UPC-E output as UPC-A***>

Default: **,** (**comma**)

Options: Any ASCII character

Code 93

Usage: Used occasionally in clinical industry.

Definition: Code 93 is a variable length, continuous symbology employing four element widths. Each Code 93 character has nine modules that may be either black or white. Each character contains three bars and three spaces.

Code 93 Status

Serial Cmd: <**K475,*status***,*fixed symbol length status,fixed symbol length*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Symbol Length Status (Code 93)

Definition: When enabled, the scanner will check the symbol length against the symbol length field. When disabled, any length is considered a valid symbol.

Serial Cmd: <**K475,***status*,***fixed symbol length status***,*symbol length*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Symbol Length (Code 93)

Usage: **Fixed Symbol Length** helps prevent truncations and increases data integrity by ensuring that only one symbol length will be accepted.

Definition: Specifies the exact number of characters that the scanner will recognize (this does not include start and stop and check digit characters). The scanner ignores any symbol not having the specified length.

Serial Cmd: <**K475,***status,fixed symbol length status,****fixed symbol length***>

Default: **10**

Options: 1 to 64

Pharmacode

Usage: Pharmacode is used mostly with packaging for the pharmaceuticals industry.

Definition: The symbol encodes up to five different numbers, each with its own color which may be entered in decimal or “binary” format with a 1 represented by a thick bar and a 0 represented by a thin bar. Bar width is independent of height.

In decimal format, each part can be up to 999999.

In binary format, each input have up to 19 ones and zeros.

Note: It is recommended that you disable AGC before enabling Pharmacode.

Pharmacode Status

Serial Cmd: <**K477,*status***, *fixed bar count status,fixed bar count, min. no. of bars,bar widths,direction,fixed threshold value*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Bar Count Status (Pharmacode)

Serial Cmd: <**K477,***status,**fixed bar count status***, fixed bar count, min. no. of bars,bar widths,direction,fixed threshold value*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Bar Count (Pharmacode)

Serial Cmd: <**K477,***status,fixed bar count status, **fixed bar count**, min. no. of bars, bar widths,direction,fixed threshold value*>

Default: **10**

Options: 2 to 16

Minimum Bars (Pharmacode)

Serial Cmd: <**K477,***status,fixed bar count status, fixed bar count, **min. no. of bars**, bar widths,direction,fixed threshold value*>

Default: **4**

Options: 2 to 16

Bar Width Status (Pharmacode)

Serial Cmd: <**K477,***status,fixed bar count status,fixed bar count, min. no. of bars,* ***bar widths****,direction,fixed threshold value>*

Default: **Mixed**

Options: 0 = Mixed 1 = Narrow
2 = Wide 3 = Fixed Threshold Value

Direction (Pharmacode)

Definition: Specifies the direction that a bar can be read.

Serial Cmd: <**K477,***status,fixed bar count status,fixed bar count,min. no. of bars, bar widths,****direction****,fixed threshold value>*

Default: **Forward**

Options: 0 = Forward 1 = Reverse

Fixed Threshold Value (Pharmacode)

Definition: Used when **Bar Width Status** field is set to **Fixed Threshold Value**.

Serial Cmd: <**K477,***status,fixed bar count status,fixed bar count,min. no. of bars, bar widths,direction,fixed threshold value>*

Default: **400**

Options: 1 to 65535

Narrow Margins

Usage: Used when the leading and trailing edges of the symbols are smaller than the standard margin or when other objects encroach into the margins.

Definition: Allows the scanner to read symbols with quiet zones less than 8 times the width of the narrow bar element. “Quiet zone” is the space at the leading and trailing ends of a symbol. Each quiet zone can be as narrow as only five times the width of the narrow bar element when **Narrow Margins** is enabled.

Serial Cmd: <**K450,*narrow margins status***,*symbology id status*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Note: Do not use **Narrow Margins** with **Large Intercharacter Gap** enabled in Code 39 or Codabar.

Symbology ID

Usage: Used when the symbology type and how it's decoded needs to be known.

Definition: Symbology ID is an AIM standard prefix set of characters that identify the symbol type.

When enabled, the scanner analyzes and identifies the symbology and adds a three character identifying prefix to the data:

1. **]** (close bracket character) indicating the presence of a symbology ID
2. **A, C, E, F, G, I, L, p, M**
   A = Code 39; C = Code 128 or EAN-128; E = UPC/EAN; F = Codabar; G = Code 93; I = Interleaved 2 of 5; L = PDF417 (special option); p = Pharmacode; M = MSI Code
3. **Modifier** (see the explanation of modifiers below)

Serial Cmd: <**K450,***narrow margins,***symbology identifier status***>

Serial Cmd: <**K450,***0,***symbology identifier status***>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Explanation of Modifiers for Code 39, Codabar, and I–2/5

- For Code 39, Codabar, and Interleaved 2 of 5, the modifier indicates **Check Digit** and **Check Digit Output Status**.
- For Code 39 only, **Full ASCII** needs to be enabled to see modifiers **4**, **5**, and **7**.

Modifier	Check Digit	Check Digit Output	Full ASCII conversion performed (Code 39 only)
0	Disabled	N/A	No
1	Enabled	Enabled	No
3	Enabled	Disabled	No
4	Disabled	N/A	Yes
5	Enabled	Enabled	Yes
7	Enabled	Disabled	Yes

Example: **]A5** indicates a Code 39 symbol with **Check Digit** and **Check Digit Output Status** enabled and Full ASCII conversion performed.

For Other Symbologies

- For Code 128, a **1** indicates EAN-128; otherwise the modifier is a **0**.
- For all other codes, the modifier is **0**.

Background Color

Usage: If the background is darker than the symbol, then enable black background.

Typically the background is white; but on PCBs for example, they can be black.

Definition: Allows the user to choose which symbol background (spaces and surrounding medium) the scanner can read.

Serial Cmd: <**K451,*background color***>

Default: **White**

Options: 0 = White 1 = Black

Autodiscriminate

Although **Autodiscriminate** is not a configuration command, but it is included here as a convenient tool for enabling most symbol types.

Usage: Commonly used for quick setup mode to detect symbol type. This is particularly useful for users who might be unfamiliar with their application's symbology.

Note: It does not alter individual fields such as **Start/Stop**, **Fixed Length**, etc. These need to be setup individually.

Definition: Enables all available symbology types except PDF417, UCC/EAN 128. The user may also individually disable/enable each symbology type.

Serial Cmd: **<P>**

Default: **Code 39** (only)

Options: **<P>** Enables all codes except noted above.

<Q> Enable Code 39 only

<R> Enable Codabar only

<S> Enable I 2/5 only

Note: If using an I 2/5 symbol, verify that the number of characters in the symbol being scanned matches the symbol length enabled for the I 2/5 symbol type (default is 10 and 6).

Symbol Ratio Mode

Symbol Ratio Mode is useful for determining how much quality and data security validation will be applied when decoding a Code 39, Codabar, Interleaved 2 of 5, or Code 93 symbol.

- **Tight** ratios will only decode a high-quality symbol.
- **Standard** ratios will decode most symbols.
- **Aggressive** ratios will not validate the entire symbol before decoding. The ratios are "loosened" to read poor-quality symbols. This setting is not recommended unless users understand the potential ramifications: character substitution rate may increase dramatically when Symbol Ratio Mode is set to Aggressive.

Code 39

Serial Cmd: <**K452,*Code 39*,*Codabar,Interleaved 2 of 5,Code 93***>
Default: **Standard**
Options: 0 = Tight
1 = Standard
2 = Aggressive

Tight

Maximum ratio is set to **3.5:1**. A Validate function, which compares the ratio between the maximum and minimum bars in the symbol, is used for additional security. A Validate Bars function minimizes the acceptance of skewed symbols.

Standard

Maximum ratio is set to **4.0:1**. A Validate function, which compares the ratio between the maximum and minimum bars in the symbol, is used for additional security.

Aggressive

Maximum ratio is set at **5.6:1**. A Validate function is not used in this mode. This method may be useful on long symbols where the spot velocity can change throughout the symbol and effect the minimum and maximum bar values.

Codabar

Serial Cmd: <**K452,***Code 39,***Codabar,***Interleaved 2 of 5,Code 93*>
Default: **Standard**
Options: 0 = Tight
1 = Standard
2 = Aggressive

Tight

Maximum ratio is set to **3.5:1**. A Validate function, which compares the ratio between the maximum and minimum bars in the symbol, is used for additional security. A Validate Bars function minimizes the acceptance of skewed symbols.

Standard

Maximum ratio is set to **4.0:1**. A Validate function, which compares the ratio between the maximum and minimum bars in the symbol, is used for additional security.

Aggressive

Maximum ratio is set at **5.9:1**. A Validate function is not used in this mode. This method may be useful on long symbols where the spot velocity can change throughout the symbol and effect the minimum and maximum bar values.

Interleaved 2 of 5

Serial Cmd: <**K452,***Code 39,Codabar,***Interleaved 2 of 5,***Code 93*>
Default: **Standard**
Options: 0 = Tight
1 = Standard
2 = Aggressive

Tight

Maximum ratio is set to **3.5:1**. A Validate function, which compares the ratio between the maximum and minimum bars in the symbol, is used for additional security. A Validate Bars function minimizes the acceptance of skewed symbols.

Standard

Maximum ratio is set to **4.0:1**. A Validate function, which compares the ratio between the maximum and minimum bars in the symbol, is used for additional security.

Aggressive

Maximum ratio is set at **6.2:1**. A Validate function is not used in this mode. This method may be useful on long symbols where the spot velocity can change throughout the symbol and effect the minimum and maximum bar values.

Code 93

Serial Cmd: <**K452,***Code 39,Codabar,Interleaved 2 of 5,***Code 93**>
Default: **Standard**
Options: 0 = Tight
1 = Standard
2 = Aggressive

Tight

Maximum ratio is set to **2.95:1**. A Validate function, which compares the ratio between the maximum and minimum bars in the symbol, is used for additional security. A Validate Bars function minimizes the acceptance of skewed symbols.

Standard

Maximum ratio is set to **2.8:1**. A Validate function, which compares the ratio between the maximum and minimum bars in the symbol, is used for additional security.

Aggressive

Maximum ratio is set at **2.65:1**. A Validate function is not used in this mode. This method may be useful on long symbols where the spot velocity can change throughout the symbol and effect the minimum and maximum bar values.

Chapter

6

I/O Parameters

Chapter Contents

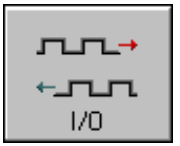
Output Conditions by ESP Menu....6-2
I/O Parameters by Serial Command....6-3
Symbol Data Output....6-4
Message Output....6-7
Noread Message....6-8
Bad Symbol Message....6-9
No Symbol Message....6-10
Beeper....6-11
Partial Output....6-12
Serial Verification....6-13
EZ Button....6-15
Output 1....6-18
Output 2....6-24
Output 3....6-25
Quality Output....6-26

This section includes instructions for setting up conditions for beeper and EZ Button controls and for changing input/output of data messages and electrical transitions for control of internal and external devices.

Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Note: You can learn the current setting of any parameter by inserting a question mark after the number, as in **<K100?>**. To see all "K" commands, send <K?>.

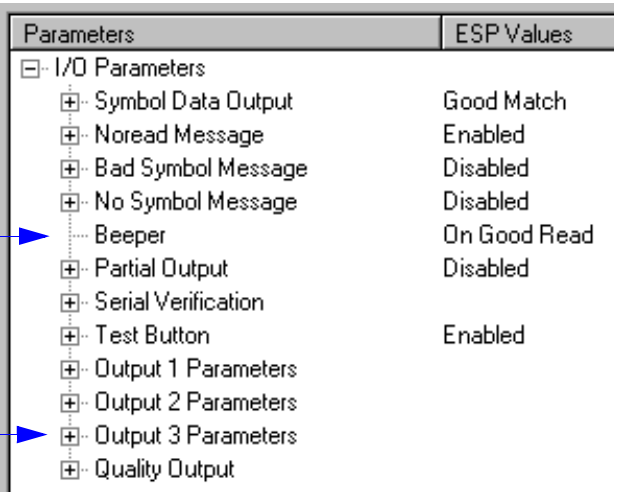
Output Conditions by ESP Menu



Click this Button to bring up the **I/O Parameters** menu

To change a setting, **double-click** the setting and use your cursor to scroll through the options.

To open nested options, **single-click** the +.



I/O Parameters by Serial Command

Command Title	Format
Symbol Data Output	<**K705,***symbol output status,when to output*>
Noread Message	<**K714,***status,noread message*>
Bad Symbol Message	<**K715,***bad symbol status,bad symbol message*>
No Symbol Message	<**K716,***no symbol status,no symbol message*>
Beeper	<**K702,***beeper output*>
Partial Output	<**K703,***partial output status,start postion,length*>
Serial Verification	<**K701,***serial command echo status,serial command beep status,control/hex output*>
EZ Button	<**K770,***global status,default on power-on*>
Output 1 Parameters	<**K810,***output on,polarity,pulse width,output mode*>
Trend Analysis (Output 1)	<**K780,***trend analysis mode,number of triggers,number to output on,decodes/trigger threshold*>
Diagnostics (Output 1)	<**K790,***usused,service threshold,unused,laser current high,laser current low*>
Output 2 Parameters	<**K811,***output on,polarity,pulse width*>
Trend Analysis (Output 2)	<**K781,***trend analysis mode,number of triggers,number to output on,decodes/trigger threshold*>
Diagnostics (Output 2)	<**K791,***usused,service threshold,unused,laser current high,laser current low*>
Output 3 Parameters	<**K812,***output on,polarity,pulse width*>
Trend Analysis (Output 3)	<**K782,***trend analysis mode,number of triggers,number to output on,decodes/trigger threshold*>
Diagnostics (Output 3)	<**K792,***usused,service threshold,unused,laser current high,laser current low*>
Quality Output	<**K704,***quality output separator,reads/trigger status*>

Symbol Data Output

Usage: Useful when the host needs symbol data only under certain conditions.

Definition: Defines the conditions under which decoded symbols are transmitted to the host.

Symbol Data Output Status

Serial Cmd: <**K705,*symbol output status*,***when to output***>*

Default: **Good Read**

Options:

0 = Disabled	2 = Mismatch
1 = Match	3 = Good Read

Note: If set to **Match** or **Mismatch**, **Symbol Output Status** will not take effect unless **Matchcode Type** is enabled and a master symbol is loaded into memory.

Disabled

Usage: Useful when an application only needs to use the discrete outputs and can allow the scanner to do the decision-making. When **Disabled**, the host does not need the symbol data and the communication lines are used only for setup and status checks.

Definition: When set to **Disabled**, the scanner will not transmit any data that is generated during a read cycle (symbols, noreads, etc.).

Match

Usage: **Match** is used in an application that requires specific symbol information and needs to sort, route or verify based on matching the specific symbol data.

Definition: When set to **Match**, the scanner transmits symbol data whenever a symbol matches a master symbol. However, if **Matchcode Type** is **Disabled**, it transmits on any good read.

Note: A noread can still be transmitted if **Enabled**.

Mismatch

Usage: **Mismatch** is typically used as a flag within the host system to prevent an item from being routed in the wrong container.

Definition: With **Mismatch** enabled, the scanner transmits symbol data whenever the symbol data information does NOT match the master symbol.

Note: A noread can still be transmitted if enabled.

Good Read

Usage: **Good Read** is used when an application requires all symbol data to be transmitted. It's typically used in tracking applications in which each object is uniquely identified.

Definition: With **Good Read** enabled, the scanner transmits symbol data on any good read regardless of **Matchcode Type** setting.

Note: A noread can still be transmitted if enabled.

When to Output Symbol Data

Definition: This command allows the user to choose when symbol data can be sent to the host.

Serial Cmd: <**K705,***symbol output status*,***when to output***>

Default: **As Soon As Possible**

Options: 0 = As Soon As Possible 1 = End of Read Cycle

As Soon As Possible

Usage: **As Soon As Possible** is useful in applications in which symbol data needs to be moved quickly to the host, typically when the host is making decisions based on symbol data.

Definition: Enabling **As Soon As Possible** causes symbol data to be sent to the host immediately after a symbol has been successfully decoded.

Note: More than one decode might in fact be required to qualify as a good decode, depending on how **Decodes Before Output** is set.

End of Read Cycle

Note: See **"End of Read Cycle Mode" on page 4-14** for options to end the read cycle.

Usage: **End of Read Cycle** is useful in timing-based systems in which the host is not ready to accept data at the time it is decoded.

Definition: Enabling **End of Read Cycle** means that symbol data does not get sent to the host until the read cycle ends with a timeout or new trigger.

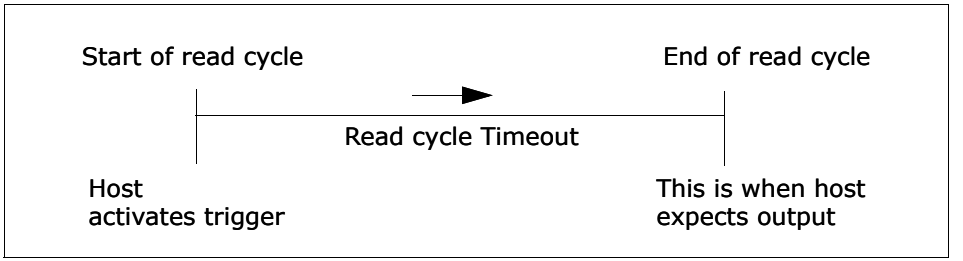
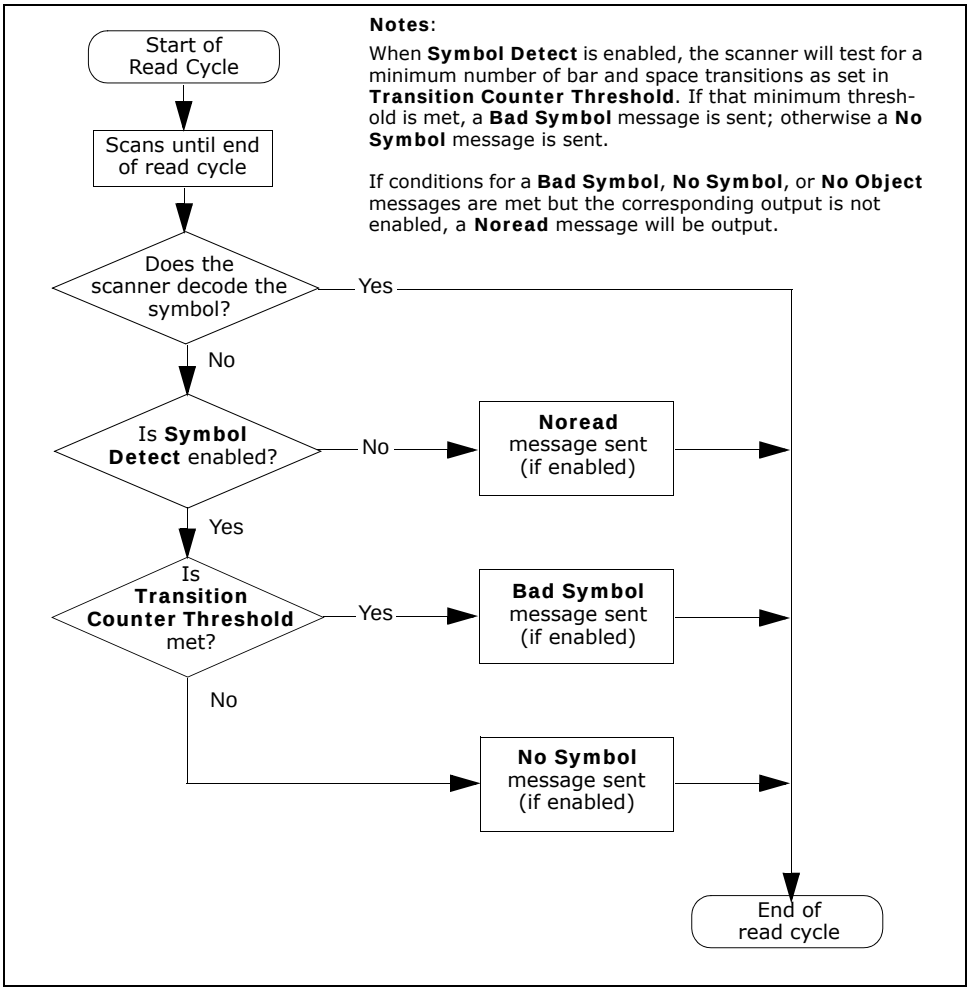


Figure 6-6 Read Cycle

Message Output

The following flow chart explains the logic paths taken for **Noread**, **Bad Symbol** and **No Symbol** outputs.


Start of Read Cycle
Scans until end of read cycle
Does the scanner decode the symbol?
Yes
No
Is Symbol Detect enabled?
No
Noread message sent (if enabled)
Yes
Is Transition Counter Threshold met?
Yes
Bad Symbol message sent (if enabled)
No
No Symbol message sent (if enabled)
End of read cycle
Notes:
When Symbol Detect is enabled, the scanner will test for a minimum number of bar and space transitions as set in Transition Counter Threshold. If that minimum threshold is met, a Bad Symbol message is sent; otherwise a No Symbol message is sent.
If conditions for a Bad Symbol, No Symbol, or No Object messages are met but the corresponding output is not enabled, a Noread message will be output.

Noread Message

Usage: Used in applications where the host needs serial verification that a symbol has not been read and especially useful in new print verification.

Definition: When enabled, and if no symbol has been decoded before timeout or the end of the read cycle, the noread message will be transmitted to the host.

Noread Status

Serial Cmd: <**K714,*status***,*noread message*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

Noread Message

Definition: Any combination of ASCII characters can be defined as the noread message.

Serial Cmd: <**K714,***status*,***message***>

Default: **NOREAD**

Options: 1 to 7 ASCII characters.

Note: Noread Message will only be transmitted if **Symbol Output** (**"Symbol Data Output Status" on page 6-4**) is set to **Match**, **Mismatch** or **Good Read**.

Noread Message can be set to any ASCII characters except **NULL < >** and **,** (comma).

Bad Symbol Message

Note: **Bad Symbol Message** does not apply to multisymbol operations.

Usage: Useful in verifying the presence of a symbol that has not been decoded.

Definition: When enabled, a message is sent to the host when a symbol is detected but not decoded. See **"Transition Counter Threshold" on page 6-8.**

The **Bad Symbol** output is tied to the transition counter. If during a read cycle no symbol is decoded and the required setting for the **Transition Sample Threshold** is met, a user defined message will be sent to the host. See **"Output Message Flow" on page 9-8.**

Bad Symbol Status

Serial Cmd: <**K715,*bad symbol status***,*bad symbol message*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Bad Symbol Message

Serial Cmd: <**K715,***bad symbol status*,***bad symbol message***>

Default: **BADCODE**

Options: Up to 10 ASCII characters (except NUL)

The **Bad Symbol** output is tied to the transition counter. If during a read cycle no symbol is decoded and the required setting for the **Transition Sample Threshold** is met, a user defined message will be sent to the host.

No Symbol Message

Note: **No Symbol Message** does not apply to multisymbol operations.

Usage: Useful in determining if an object has an attached symbol.

Definition: When enabled, sends a message to the host whenever an object is detected but no symbol is detected.

The **No Symbol** output is tied to the transition counter. If during a read cycle no symbol is decoded and the required setting for the **Transition Sample Threshold** is NOT met, a user defined message will be sent to the host. See **"Transition Counter" on page 4-20**.

No Symbol Status

Serial Cmd: <**K716,*no symbol status***,*no symbol message*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

No Symbol Message

Serial Cmd: <**K716,***no symbol status*,***no symbol message***>

Default: **NO_SYMBOL**

Options: Up to 10 ASCII characters (except NUL)

Beeper

Usage: Can be used as an audible verification that either a good read or a noread has occurred.

Definition: A beep is emitted either after each good read of a symbol or after each noread, according to the **Beeper Output Condition** selection.

Note: Beeper will also sound if any of the following occur:

- the scanner is defaulted a send/save command from **ESP** or an **Exit** command from any embedded menu.
- a **<Z>**, **<Zp>**, **<Zd>**, or **<K,1>** command is sent

Beeper Output Condition

Serial Cmd: <**K702,*beeper output***>

Default: **On Good Read**

Options: 0 = Disabled 1 = On Good Read 2 = On Noread

Partial Output

Definition: When enabled, allows you to pre-select portions of symbols to be transmitted by the scanner.

Usage: In **Multisymbol** mode, partial output is performed on each separate symbol. For example, if **Start Position** is set to 3 and **Partial Length** is set to 5, the following symbols are transmitted as follows:

1234567890 as 34567

1234 as 34

123456789,abcde as "34567,cde" (two symbols with separator)

12 as [blank]

Status

Serial Cmd: <**K703,*partial output status*,***start position*,*length*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Start Position (Partial Output)

Definition: Allows you to determine the first character from the beginning of a symbol to transmit.

Serial Cmd: <**K703,***partial output status*,***start position***,*length*>

Default: **1**

Options: 1 to 64

Length (Partial Output)

Definition: Allows you to determine the number of characters to be transmitted.

Serial Cmd: <**K703,***partial output status*,*start position*,***length***>

Default: **63**

Options: 1 to 64

Serial Verification

Usage: These commands are useful in removing any doubt about the scanner's acceptance and response to host configuration commands.

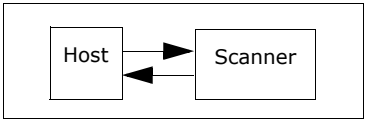
For example, if the current preamble is "SOM" and <Kd1, START> is entered, the scanner will echo back <Kd1, SOM> since the attempted entry "START" exceeds the four character limit for that command. Therefore it is rejected and the existing "SOM" message is echoed back and remains the preamble message.

Definition: Allows the user to verify configuration command status.

Serial Command Echo Status

Important Note: ESP will not function whenever this command is enabled.

Definition: When enabled, a configuration command received from the host is echoed back to the host with the resultant settings.



Function: If a command with multiple fields is processed, some of the fields may have been processed properly while others were not. The changes will appear in the string echoed back so that the user will know which fields did or did not change.

Serial Cmd: <**K701,*serial command echo status***,*serial command beep status,control/hex output*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Serial Command Beep Status

Important Note: ESP will not function whenever this command is enabled.

Usage: Used to audibly verify the acceptance and validity of a command.

Definition: Causes the scanner to beep once whenever a K command is entered to indicate that the command was accepted and processed.

Function: If an invalid command is entered, the scanner beeps 5 times to indicate an invalid entry. However, this does not necessarily mean that all data fields have been entered incorrectly. Only one bad field needs to be found in order to activate the 5 beep response.

Serial Cmd: <**K701,***serial command echo status*,***serial command beep status***,*control/hex output*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Control/Hex Output

Usage: Useful for viewing settings with binary characters when using serial command on a terminal.

Definition: Determines the response to a **Serial Command Echo** or status request command.

When set to **Control**, two characters are transmitted to represent a non-displayable character. For example, a carriage return will be shown as the two characters: **^M**.

When set to **Hex**, the output is the hex character.

Serial Cmd: <**K701,***serial command echo status*,*serial command beep status*,***control/hex output***>

Default: **Control**

Options: 0 = Control 1 = Hex

EZ Button

The EZ Button provides a convenient way to perform programmable operations both globally and for each of the three programmable button positions.

The EZ Button has three positions, each of which can be user-programmed to perform a variety of functions.

Global Status

Definition: Determines the basic function of the EZ Button.

Serial Cmd: <**K770,*global status***,*default on power-on*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled 2 = Trigger
3 = Unlatch Output

Disabled: When selected, the EZ Button is disabled.

Enabled: When the EZ Button is enabled, the function of each button position can be determined by the **EZ Button Mode** command.

Trigger: When selected, the EZ Button will act as a trigger for the scanner. All other button operations will not be active. The trigger will operate the same way as an external trigger.

Trigger mode	Operation
External Level	The read cycle endures for as long as the EZ Button is pressed, unless a timeout occurs and **Timeout** is enabled for **End Of Read Cycle**.
External Edge	As with **Level**, **Edge** allows a read cycle to be initiated by pressing the EZ Button, but unlike **Level** mode, the read cycle ends with a good read output, a timeout, or a new trigger.

Unlatch Output. When selected, will unlatch any outputs that have been latched via **"Latch Mode 1 (Unlatch on New Master Change)" on page 6-20**.

Default on Power-on

Definition: When enabled, if the EZ Button is held down during power-on, the scanner will default to customer defaults and save for power-on. This is the same as sending a <Zrc> command.

Serial Cmd: <**K770,***global status*,***default on power-on***>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

EZ Button Modes

Definition: Provides six user-selectable functions for each of the three EZ Button positions.

Serial Cmd: <**K771,***position 1 mode,position 2 mode,position 3 mode*>

Defaults: As indicated in the table below.

Options: As indicated in the table below.

The positions are selected by the length of time the button is held. When you want to select position one, you press and holds the button until one beep is emitted from the scanner and the 20% LED is turned on. You then release the button to select position one. If you want to select position two, you continue to hold until you hear two short beeps and the 40% LED is turned on. Finally, to select position three, you continue to hold the button until you hear three short beeps and the 60% LED is turned on.

For example, if you want to select the function for position three, you will hear one short beep, then two short beeps, and finally three short beeps and the 20%, 40%, and 60% LEDs turn on in progression.

The following table lists the options for the three positions with the default position in bold text:

EZ Button Options

Single Beep	Two Beeps	Three Beeps
0 = Disabled	0 = Disabled	0 = Disabled
1 = Read Rate	1 = Read Rate	1 = Read Rate
2 = Autocalibration	**2 = Autocalibration**	2 = Autocalibration
3 = Save for Power-on	3 = Save for Power-on	**3 = Save for Power-On**
4 = Auto Framing	4 = Auto Framing	4 = Auto Framing
5 = Load New Master	5 = Load New Master	5 = Load New Master
6 = Sleep Mode	6 = Sleep Mode	6 = Sleep Mode

Disabled: When set to **Disabled**, the button position will have no function associated with it. The scanner will still respond when the button position is reached.

Read Rate: Read rate will perform decodes/second and is the same as sending a **<C>** from the terminal. To exit read rate mode, press the EZ Button once quickly.

Calibration: The calibration routine will be initiated. To abort calibration, press the EZ Button once quickly.

Save for Power-on: When when this button position is selected, all scanner settings will be saved to non-volatile memory to be recalled when scanner is powered-on the next time. This is the same as sending the **<Z>** in the terminal.

Auto Frame: Auto Framing will be initiated when this button position is selected. To abort auto-framing, press the EZ Button once quickly. Auto framing is a background routine that automatically adjusts the scan width to the length of a symbol. This procedure can also be accessed in a terminal view by the <@> command.

Load New Master: This allows the button to function the same as the New Master Pin command. The new master pin's consecutive decode requirement holds true for this button position when this mode is selected. (See**"New Master Pin" on page 7-9**.)

Sleep Mode: If sleep mode is enabled, the EZ Button will shut off the mirror motor and laser. To exit sleep mode, press the EZ Button once quickly.

Output 1

Usage: This option provides switching to host software to control external devices such as PLCs and relays. It is useful for routing and sorting and to prevent mis-packaging and mis-routing.

Definition: Sets the discrete output functions for specific user-selected conditions.

Output On

Definition: Allows the user to set the conditions under which an output (or outputs) will be activated.

Serial Cmd: <**K810,*output on***,*polarity,pulse width,output mode*>

Default: **Mismatch or Noread**

Options:

0 = Mismatch or Noread	4 = Trend Analysis
1 = Match	5 = Validation
2 = Mismatch	6 = Diagnostic Warning
3 = Noread	

Note: If **Output On** is set to **Mismatch or Noread**, **Match**, or **Mismatch**, a transition (switching) will not occur unless **Matchcode Type** is enabled and a master symbol is loaded into memory.

Mismatch or Noread

Activates discrete output when the symbol data does not match that of the master symbol or the symbol has not been decoded before the end of the read cycle.

Match

Activates a discrete output when the symbol data matches the master symbol.

Note: If you want to output for a good read and **Matchcode** is not enabled, you can enable any output for **Match**.

Mismatch

Activates a discrete output whenever the symbol data does not match that of the master symbol.

Noread

Activates a discrete output whenever the symbol data is not decoded before the end of the read cycle.

Trend Analysis

Tracks the occurrences and frequency of mismatches, noreads, and the number of reads per trigger and output the results to any of three outputs.

Validation

(Not yet implemented)

Diagnostic Warning

The output remains active as long as one of the diagnostic conditions is met.

Polarity

Definition: Sets the polarity of the discrete output.

When set to **Negative** polarity, and an output condition from the scanner is met, the output-1 pin on the scanner's 15 pin connector go low for the time specified in **Pulse Width**. (See **Table A-3, "MS-3 Laser Connector, 15-pin Socket," on page A-4**.)

Serial Cmd: <**K810,***output on*,***polarity***,*pulse width*,*output mode*>

Default: **Negative**

Options: 0 = Negative 1 = Positive

Pulse Width

Definition: Sets the time in 1mS increments that the discrete output remains active.

Serial Cmd: <**K810,***output on*,*polarity*,***pulse width***,*output mode*>

Default: **50** (50mS)

Options: 0 to 65535 (0 to 65.535 seconds). Divide the number entered on the command line by 1000 for time in seconds.

Output Mode

Definition: Sets the condition in which the discrete output is de-activated.

Serial Cmd: <**K810,***output on*,*polarity*,*pulse width*,***output mode***>

Default: **Pulse**

Options:

0 = Pulse	2 = Latch Mode 2
1 = Latch Mode 1	3 = Latch Mode 3

Pulse

Definition: This is the default mode of operation in which the programmable output is activated when the **Output On** condition has been met and held active for the duration of the selected pulse width.

Latch Mode 1 (Unlatch on New Master Change)

Definition: The programmable output will be activated when the **Output On** condition is met and will stay active until the state of the new master pin changes from inactive to active or the configuration button is depressed in the appropriate mode.

Important Note: To unlatch using the new master pin the new master pin status must be set to disabled. To unlatch using the button the button status must be set to unlatch mode.

Latch Mode 2 (Unlatch Opposite Condition)

Definition: The programmable output is activated when the **Output On** condition has been met and held active until the opposite condition selected under **Output On** has been met.

For example, if **Noread** is enabled under **Output On**, the programmable output will go active upon a noread and remain active until the opposite condition, a good read, occurs.

Latch Mode 3 (Unlatch Enter Read Cycle)

Definition: The programmable output is active when the **Output On** condition has been met and is held active until a new read cycle begins.

NOTE: All of the **Output On** modes are inhibited when any **Output on Warning** is active for **Output 1** (see <K713> command).

Trend Analysis (Output 1)

Usage: Useful in cases in which the user doesn't want to shut down for one condition but wants to monitor quality and read conditions.

Definition: Applies trend analysis settings to Output 1.

With **Trend Analysis**, the user can track the occurrences and frequency of mismatches, noreads, and the number of reads per trigger and output the results to any of three outputs.

Example: *Trend analysis mode = Noread*

Number to Output On = 4

Number of Triggers = 5

In this example, the scanner will activate an output whenever 4 noreads occur within 5 triggers (read cycles).

Trend Analysis Mode

Definition: Sets the trend condition (**Mismatch**, **Noread**, or **Reads/Trigger**) that will activate the output.

Serial Cmd: <**K780,*trend analysis mode***,*number of triggers*,*number to output on*,*decodes/trigger threshold*>

Default: **Noread**

Options: 0 = Mismatch

1 = Noread

2 = Decodes per Trigger

Mismatch

Definition: Output will be activated when the number of **Mismatches** equals the value entered for **Number to Output On** within the trigger window selected in **Trigger Evaluation Period**.

Noread

Definition: The output will be activated when the number of noreads equals the value entered for **Number to Output On** within the trigger window selected in **Trigger Evaluation Period**.

Number of Triggers (Trend Analysis)

Definition: The number of triggers to examine for the trend analysis condition.

Serial Cmd: <**K780,***trend analysis mode*,***number of triggers***,*number to output on*,*decodes/trigger threshold*>

Default: **0**

Options: 0 to 255

Number to Output On (Trend Analysis)

Definition: Sets the number of **Trend Analysis** events (mismatches, noreads or reads/trigger as configured by **Trend Analysis Mode**) to occur within the **Number of Triggers** before activating the associated output.

Usage: For example, if **Number to Output On** is set to 3 and **Trend Analysis Mode** is set to **Noread**, then the output will not be activated until 3 noreads have occurred.

Serial Cmd: <**K780,***trend analysis mode*,*number of triggers*,***number to output on***,*decodes/trigger threshold*>

Default: **0**

Options: 0 to 255

Decodes per Trigger (Trend Analysis)

Note: This setting only applies when **Trend Analysis Mode** is set to **Decodes per Trigger**.

Definition: Sets the threshold for decodes required per trigger (read cycle) that must occur before an output can be activated.

Example: *Trend analysis mode = Decodes per Trigger*

Number to Output On = 4

Number of Triggers = 25

Decodes per Trigger Threshold = 10

In this example, the scanner will activate an output whenever the number of decodes falls below the decodes per trigger threshold (10) for 4 trigger (read cycle) events.

Serial Cmd: <**K780,***trend analysis mode*,*number of triggers*,*number to output on*,***decodes/trigger threshold***>

Default: **0**

Options: 0 to 65535

Diagnostics (output 1)

Applies warning to Output 1.

Note: When **Diagnostics** is enabled (**"Output On" on page 6-18**), the output mode configuration has no effect. The output will remain active as long as one of the diagnostic conditions is met. The output will go inactive as soon as it detects no active diagnostic warning.

Usage: Alerts user to critical conditions.

Definition: Sets up the destinations and specific warnings that will cause activation. (See **Chapter 8, "Diagnostics"** for more information.)

Service Threshold

Definition: Activates the output whenever the service threshold has been met. Will output upon every occurrence of the threshold.

Serial Cmd: <**K790,***ususedd*,***service threshold***,*unused*,*laser current high*,*laser current low*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Laser Current High

Definition: Activates the output whenever the high current threshold has been met. Will output once.

Serial Cmd: <**K790,***usused*,*service threshold*,*unused*,***laser current high***,*laser current low*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Laser Current Low

Definition: Activates the output whenever the high current threshold has been met. Will output once.

Serial Cmd: <**K790,***usused*,*service threshold*,*unused*,*laser current high*,***laser current low***>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Output 2

Serial Cmd: <**K811,***output on,polarity,pulse width,output mode*>

Output 2 has the same parameters and default settings as **Output 1**.

Trend Analysis (output 2)

Definition: Applies trend analysis settings to Output 2.

Serial Cmd: <**K781,***trend analysis mode,number of triggers,number to output on,decodes/trigger threshold*>

Trend Analysis to Output 2 has the same parameters and default settings as **Trend Analysis to Output 1**.

Diagnostic Warnings (output 2)

Definition: Applies warning to Output 2.

Serial Cmd: <**K791,***usused,****service threshold****,unused,laser current high,laser current low*>

Diagnostic Warnings to Output 2 has the same parameters and default settings as **Diagnostic Warnings to Output 1**.

Output 3

Serial Cmd: <**K812,***output on,polarity,pulse width,output mode*>

Output 3 has the same parameters and default settings as **Output 1**.

Trend Analysis (output 3)

Definition: Applies trend analysis settings to Output 3.

Serial Cmd: <**K782,***trend analysis mode,number of triggers,number to output on,decodes/trigger threshold*>

Trend Analysis to Output 3 has the same parameters and default settings as **Trend Analysis to Output 1**.

Diagnostic Warnings (output 3)

Definition: Applies warning to Output 3.

Serial Cmd: <**K792,***usused,service threshold,unused,laser current high,laser current low*>

Diagnostic Warnings to Output 3 has the same parameters and default settings as **Diagnostic Warnings to Output 1**.

Quality Output

Usage: Host system can monitor scanning performance (printing process, scanning environment changes, etc.) by setting thresholds in their processing or displaying the outputs for visual verification.

Definition: Allows the host to track the number of good reads per trigger by appending a five digit numeric field to the end of symbol data.

When enabled, symbol data is followed by a separator, followed by the five digits in the form of 00000. For example, a certain symbol that has been averaging 00100 reads per read cycle suddenly drops to 00012, this would be a good indication that a problem has arisen even though good reads are still occurring.

Quality Output Separator

Serial Cmd: <**K704,*quality output separator***,*reads/trigger status*,*decode direction status*>

Default: **,** (comma)

Options: any ASCII character

Note: For all serial configuration commands, the following characters cannot be used:**, < > NUL**

Reads/Trigger Status

Serial Cmd: <**K704,***quality output separator*,***reads/trigger status***,*decode direction status*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Decode Direction Output

Definition: If enabled the decode direction is appended to the barcode output with a quality output separator as an "F" (forward) or an "R" (reverse).

Serial Cmd: <**K704,***quality output separator*,*reads/trigger status*,***decode direction status***>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Chapter

7

Matchcode

Chapter Contents

Matchcode by ESP 7-2
Matchcode by Serial Command 7-2
Overview of Matchcode 7-3
Using Master Symbols 7-3
Matchcode Type 7-4
New Master Pin 7-9
Master Symbol Database 7-10

This section explains the matchcode output functions and the master symbol database setup.

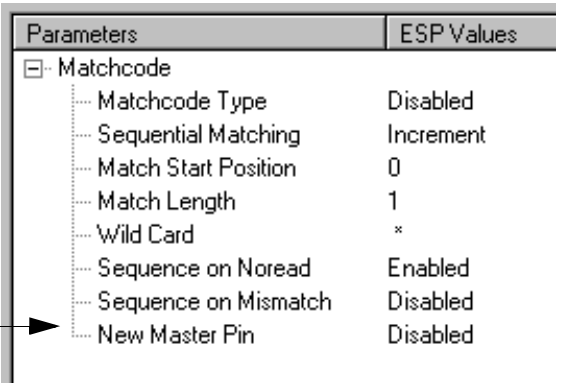
Note: When assigning characters in user-defined fields, the characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Note: You can learn the current setting of any parameter by inserting a question mark after the number, as in **<K100?>**. To see all "K" commands, send <K?>.

Matchcode by ESP

Click this button to bring up the **Matchcode** menu.

To change a setting, **double-click** the setting and use your cursor to scroll through the options.



Matchcode by Serial Command

Command Title	Format
Matchcode Type	<**K223,***matchcode type,sequential matching,match start position,match length,wild card character, sequence on noread,sequence on mismatch*>
New Master Pin	<**K225,***status*>
Master Symbol Database Size	<**K224,***number of master symbols*>
Matchcode Enable	<**K223,***status*>
Enter data to database	<**K231,***master symbol number,master symbol data*>
Request Master Symbol Information	<**K231?,***master symbol number*>
Request all Master Symbol Information	<**K231,?**>
Delete Master Symbol	<**K231,***master symbol number,*>
Store Next Symbol as Master Symbol	<**G***master symbol number*>

Overview of Matchcode

Usage: **Matchcode** is used in applications to sort, route, or verify data based on matching the specific symbol in a variety of ways as defined in this section. For example, a manufacturer might sort a product based on dates that are embedded in the symbol.

Definition: With **Matchcode** you can store master symbol data in the scanner's memory, compare this data against the scanned symbols, and define how symbol data and/or discrete signal output will be directed. A master symbol database can be set up for up to 10 master symbols. See **"Master Database" on page 11-8**.

Using Master Symbols

1. Set **Triggering Mode** to **External** or **Serial** (see **"Trigger Mode" on page 4-6**).
2. Chose the method of symbol comparison that fits your application (see **"Matchcode Type" on page 7-4**).
3. Define the output you want with your matchcode setup:
   a) Symbol output (**"Symbol Data Output Status" on page 6-4**).
   b) Discrete output (see **Chapter 6, "I/O Parameters"**).
4. Select the number of master symbols you want to create, if more than one (see **"Master Symbol Database Size" on page 11-8**).
5. Enter master symbol data in one of the following ways:
   a) Use **ESP** to type in master symbol data directly into the **Utilities** menu.
   b) Send a serial command with symbol data in the form of **<M*master symbol#,data*>** (or **<)*data*)>** for single master symbol only).
   c) Send a **<G*master symbol number*>** command to scan next symbol in as the master symbol.
   d) Enable the **New Master Pin** command and activate a discrete input to store the next symbol scanned as the master symbol (see **"New Master Pin" on page 7-9**). Other Master Symbol Serial Commands

See also **"Master Symbol Database Size" on page 11-8** for more information details on entering, requesting, and deleting master symbols.

Matchcode Type

Note: When **Matchcode** is set to **Enabled**, **Wild Card** or **Sequential**, **Number of Symbols** will default back to **1** (if set to any number greater than 1).

Definition: Allows the user to choose the way that master symbols will be compared with subsequently scanned symbols.

Note: First set **Triggering Mode** to **External** or **Serial**.

Serial Cmd: <**K223,*matchcode type***,*sequential matching,match start position, match length,wild card character,sequence on noread,sequence on mismatch*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

2 = Wild Card 3 = Sequential

Disabled: Has no effect on operations.

Enabled: Instructs the scanner to compare symbols or portions of symbols with the master symbol.

Sequential Matching: Instructs the scanner to sequence after each match (numeric only) and compare symbols or portions of symbols for sequential numbers.

Note: If **Matchcode Type** is set to **Sequential**, **Number of Symbols** will default back to **1** (if set to any number greater than 1).

Wild Card: Allows the user to enter user defined wild card characters in the master symbol.

Sequential Matching

Usage: Useful in tracking product serial numbers that increment or decrement sequentially.

Definition: With **Sequential** enabled, **Sequential Matching** determines if a count is in ascending (incremental) or descending (decremental) order.

Serial Cmd: <**K223,***matchcode type*,***sequential matching***,*match start position, match length,wild card character,sequence on noread,sequence on mismatch*>

Default: **Increment**

Options: 0 = Increment 1 = Decrement

Match Start Position

Usage: **Match Start Position** is useful in defining specific portions of a symbol for comparisons. For example, if a symbol contains a part number, manufacturing date, and lot code info but the user is only interested in the part number information, **Match Start Position** can be set to only sort on the part number and ignore the rest of the characters.

Definition: **Match Start Position** determines the portions of symbols that will be matched by defining the first character in the symbol (from left to right) that will be compared with those of the master symbol, when **Matchcode Type** is set to **Enabled** or **Sequential**.

Function: For example, if **Match Start Position** is set to 3, the first 2 characters read in the symbol will be ignored and only the 3rd and subsequent characters to the right will be compared, up to the number of characters specified by **Match Length**.

Serial Cmd: <**K223,***matchcode type*,*sequential matching*,***match start position***, *match length*,*wild card character*,*sequence on noread*,*sequence on mismatch*>

Default: **0**

Options: 0 to 64

Note: **Match Start Position** must be set to **1** or greater to enable this feature. A **0** setting will disable this feature.

Match Length

Usage: For example, if **Match Length** is set to **6** in a 10 character symbol, and **Match Start Position** is set for **2**, only the 2nd through 7th characters (from left to right) will be compared.

Definition: Defines the length of the character string that will be compared with that of the master symbol when **Match Start Position** is set to **1** or greater. When **Match Start Position** is set to **0**, no comparison will occur.

Serial Cmd: <**K223,***matchcode type,sequential matching,match start position,* ***match length****,wild card character,sequence on noread,sequence on mismatch*>

Default: **1**

Options: 1 to 64

When more than one master symbol is enabled, the maximum number for each additional symbol diminishes as shown here:

# of Symbols:	1	2	3	4	5	6	7	8	9	10
Maximum characters:	64	64	42	32	25	21	18	16	14	12

Wild Card Character

Usage: For example, with **Wild Card Character** defined as the default asterisk, defining **CR*34** as the master symbol will result in matches for CR**1**34, CR**2**34, but not CR2345. Entering the wild card at the end of the master symbol as in **CR*** will result in matches for variable symbol lengths such as CR**1**, CR**23**, CR**358**, etc.

Definition: **Wild Card Character** allows a user to define a wild card character as part of the master symbol.

Serial Cmd: <**K223,***matchcode type,sequential matching,match start position, match length,* ***wild card character****,sequence on noread,sequence on mismatch*>

Default: ***** (asterisk)

Options: Any valid ASCII character

Sequence On Noread

Usage: **Sequence On Noread** is useful when the scanner needs to stay in sequence even if no decode occurs.

Definition: When **Sequence On Noread** is **Enabled** and **Matchcode** is set to **Sequential**, the scanner sequences the master symbol on every match or noread. When disabled, it does not sequence on a noread.

Serial Cmd: <**K223,***matchcode type,sequential matching,match start position, match length,wild card character,**sequence on noread**,sequence on mismatch*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

As an example of **Sequence on Noread Enabled**, consider the following series of decodes:

Master symbol	Decoded symbol	Master symbol after decode
001	001	002
002	002	003
003	noread	004 (sequenced on noread)
004	004	005
005	noread	006 (sequenced on noread)
006	noread	007 (sequenced on noread)
007	007	008

As an example of **Sequence on Noread Disabled**, consider the following series of decodes:

Master symbol	Decoded symbol	Master symbol after decode
001	001	002
002	002	003
003	noread	003 (not sequenced)
003	003	004
004	noread	004 (not sequenced)
004	noread	004 (not sequenced)
004	004	005

Sequence On Mismatch

Note: **Matchcode** must be set to **Sequential** for this command to function.

Usage: Enable this parameter if every trigger event should have a decode *and* more than one consecutive mismatch may occur.

Disable this parameter if every trigger event should have a decode but no more than one consecutive mismatch may occur.

Definition: When set to **Enabled**, the master symbol sequences on every decode, match or mismatch.

When set to **Disabled**, the master symbol will not sequence whenever consecutive mismatches occur.

Serial Cmd: *<**K223,**matchcode type,sequential matching,match start position, match length,wild card character,sequence on noread,**sequence on mismatch**>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

The scanner will sequence the master to one more/less than the decoded symbol. As an example of **Sequence On Mismatch Enabled**, consider the following decodes:

Master symbol	Decoded symbol	Master symbol after decode
001	001	002
002	002	003
003	abc	004 (sequenced on mismatch)
004	004	005
005	def	006 (sequenced on mismatch)
006	ghi	007 (sequenced on mismatch)
007	007	008

As an example of **Sequence On Mismatch Disabled**, consider the following decodes:

Master symbol	Decoded symbol	Master symbol after decode
001	001	002
002	002	003
003	abc	004 (sequenced because of previous match)
004	004	005
005	def	006 (sequenced because of previous match)
006	ghi	006 (not sequenced because of previous mismatch)
006	006	007

New Master Pin

Usage: Some applications require the line worker to change the master symbol. This can be done by installing a switch at the location of the scanner. It is very common to have a keyed switch so that accidental switching does not occur.

Definition: After **New Master Pin** is enabled, a pulse can be received on the new master pin which will cause the scanner to record the next decoded symbol(s) as the new master symbol(s).

It is important to note that the enabling **New Master Pin** does not in itself cause a master symbol to be recorded. The master pin must then be activated momentarily (for a minimum of 10 ms) before a master symbol can be scanned into memory. (See **"Electrical Specifications" on page A-4**.)

Serial Cmd: <**K225,*status***>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

After **New Master Pin** has been enabled and the pin activated, decodes will be saved in the master database beginning with master symbol #1. If the scanner is configured for a multisymbol read cycle (**Number of Symbols** is greater than 1), the remaining decodes will be saved in each consecutive master symbol location. For example, if **Number of Symbols** is set to **3** and **New Master Pin** is then activated, at the end of the next read cycle, the decoded symbols will be saved as master symbols 1, 2, and 3.

Master Symbol Database

See **"Master Database" on page 11-8** for more detailed information.

Usage: Useful where more than one master symbol is required, as in a **Multi-symbol** setup, for matching and other matchcode operations.

Definition: Allows you to define up to 10 master symbols as the master symbol database, which can be entered by keyboard, scanned in, displayed, or deleted by serial or ESP commands.

Request Master Symbol Data

Definition: Returns master symbol data for any enabled master symbols from 1 to 10.

For example, to request master symbol #5, enter **<K231?,5>**. The scanner transmits the following format: **<K231,5,*data*>**. If no master symbol data available, the output will be: **<M5/?>**.

Serial Cmd: Send <**K231?,*master symbol number***> to request the current master symbol for a specific master symbol.

Returns all master symbols if no number is added before the question mark.

Options: 1 to 10

Request All Master Symbols Data

Definition: Returns master symbol data for all enabled master symbols from 1 to 10.

Serial Cmd: Send <**K231?**> to request all current master symbols.

Delete Master Symbol Data

Definition: **Delete Master Symbol Data** allows you to delete an enabled master symbol.

Serial Cmd: Send <**K231,*master symbol number,***> to delete the master symbol.

Options: 1 to 10

Chapter

8

Diagnostics

Chapter Contents

Diagnostics by ESP Menu 8-2
Diagnostics by Serial Command 8-2
Diagnostic Messages Overview 8-3
Counts 8-4
Hours Since Last Reset 8-6
Laser High 8-7
Laser Low 8-8
Service Message 8-9

This section describes warning and operating messages and their settings.

Important: Since **Warning Messages** and **NOVRAM Messages** are not enabled by default, these messages will not be displayed. However, if you suspect that erroneous defaults are occurring, enable **Warning Messages** and **NOVRAM Messages** by sending **<K"400,1,,,1>**.

Note: When assigning characters in user-defined fields, the characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

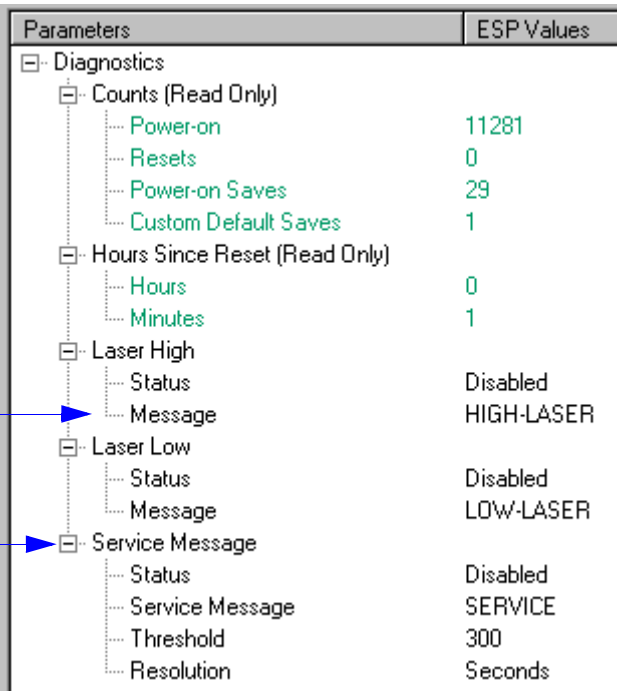
Note: You can learn the current setting of any parameter by inserting a question mark after the number, as in **<K100?>**. To see all "K" commands, send <K?>.

Diagnostics by ESP Menu

Click this button to bring up the **Diagnostic** menu.

To change a setting, **double-click** the setting and use your cursor to scroll through the options.

To open nested options, **single-click** the +.



Diagnostics by Serial Command

Command Title	Format
Counts, Power-on/Resets	<**K406,***power-on,resets,power-on saves,custom default saves*>
Hours Since Last Reset	<**K407?**> (*read only— returns: hours,minutes)*
Laser High/Low	<**K411,***laser high status,laser high message,laser low status,laser low message*>
Service Message	<**K409,***status,service message,threshold,resolution*>

Diagnostic Messages Overview

Usage: These messages serve as a flag to service a scanner or as an early warning that potential problems could arise. They are particularly useful in factories that run 24/7 and can't afford down time.

Definition: Warning messages that relate to the environment and condition of the scanner can be defined and set to activate specific outputs.

Note: When enabled, the error condition will override all other operational modes configured for the output.

When enabled, laser current and NOVRAM warning messages will be transmitted to the host or any active port whenever the pre-defined conditions are met.

Counts

(These commands are **READ ONLY**.)

Sending **<K406?>** returns a four fields of data, as follows:

<**K406,***power-on*,*resets*,*power-on saves*,*customer default saves*>

Power-on Count

Usage:	Useful for detecting unwanted resets caused by power supply problems or ESD transients.
Definition	Returns the number of times the scanner has been re-powered.
Serial Cmd:	Send <**K406?**> Returns < *(read only)*
Read Only Ranges:	0 to 65,535 powerups, 0 to 65,535 resets.

Resets

Usage:	Useful for detecting unwanted resets caused by power supply problems or ESD transients.
Definition	Returns Resets for all the "warm" resets, including <A>, <Ard>, <Arp> and <Arc>.
Serial Cmd:	Send <**K406?**> Returns <**K406,***power-on*,***resets***,*power-on saves*,*custom default saves*>
Read Only Ranges:	0 to 65,535 powerups, 0 to 65,535 resets.

Power-on Saves

Usage:	Useful for detecting unwanted resets caused by power supply problems or ESD transients.
Definition	Returns the number of times the scanner saves for the power-on resets, including <Z>, <Zc>, <Zrd>.
Serial Cmd:	Send <**K406?**> Returns <**K406,***power-on*,*resets*,***power-on saves***,*custom default saves*>
Read Only Ranges:	0 to 65,535 powerups, 0 to 65,535 resets.

Customer Default Saves

Usage:	Useful for detecting unwanted resets caused by power supply problems or ESD transients.
Definition	Returns the number of customer default saves: <Zrd>.
Serial Cmd:	Send <**K406?**> Returns <**K406,***power-on*,*resets*,*power-on saves*,***custom default saves***>
Read Only Ranges:	0 to 65,535 powerups, 0 to 65,535 resets.

Hours Since Last Reset

(This command is READ ONLY.)

Usage:	Useful as a troubleshooting tool that can help pinpoint the cause of a reset.
Definition:	Records the number of hours and minutes of operation since the last system reset.
Serial Cmd:	Send <**K407?**> Returns <**K407*hours,minutes***>
Read Only Ranges:	0 to 23 hours, 0 to 59 minutes.

Laser High

When enabled, a message is transmitted whenever the laser current exceeds a factory-calibrated reference value which cannot be altered. The message repeats once every 30 minutes until the condition is corrected.

Laser High Status

Usage: Alerts the user to impending laser failure. (Contact Service.)

Definition: Enables the **Laser High** message.

Serial Cmd: <**K411,*laser high status***,*laser high message,laser low status,laser low message*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

Laser High Message

Definition: Defines the **Laser High** message.

Serial Cmd: <**K411,***laser high status*,***laser high message***,*laser low status,laser low message*>

Default: **HIGH-LASER**

Options: Any 1 to 10 character ASCII string except **NUL**, **<**, or **>**.

Laser Low

When enabled, a message is transmitted whenever the laser current falls below a factory-calibrated reference value which cannot be altered. The message repeats once every 30 minutes until the condition is corrected.

Laser Low Status

Usage: Alerts the user to impending laser failure. (Contact Service.)

Definition: Enables the **Laser Low** message.

Serial Cmd: <**K411,***laser high status*,*laser high message*,***laser low status***,*laser low message*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

Laser Low Message

Definition: Defines the **Laser Low** message.

Serial Cmd: <**K411,***laser high status*,*laser high message*,*laser low status*,***laser low message***>

Default: **LOW-LASER**

Options: Any 1 to 10 character ASCII string except **NUL**, **<**, or **>**.

Service Message

Definition: The service timer is reset on power-on, thus the timer only records the time that has elapsed since the last reset.

The message is sent every time the timer expires.

Service Message Status

Definition: When enabled, a message is sent whenever the system detects that a user-set service time has expired.

Serial Cmd: <**K409,*status***,*service message,threshold,resolution*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Service Message

Serial Cmd: <**K409,***status*,***service message***,*threshold,resolution*>

Default: **SERVICE**

Options: Any 1 to 10 ASCII characters except **NULL < ,** or **>**.

Threshold

Definition: Sets the number of hours or minutes that will transpire before the Service message is output.

Serial Cmd: <**K409,***status,service message*,***threshold***,*resolution*>

Default: **300** (5 minutes)

Options: 1 to 65,535

Resolution

Definition: Records time in seconds or minutes.

Serial Cmd: <**K409,***status,service message,threshold*,***resolution***>

Default: **Seconds**

Options: 0 = Seconds 1 = Minutes

Chapter

9

Calibration

Chapter Contents

Calibration 9-2
Auto Frame 9-6

The purpose of calibration is to optimize certain scanner settings to obtain the highest read rates in one or several label positions as required by the user's application. This section includes the overall steps in calibration and specific steps for calibration by ESP, serial command, and embedded menus. For most applications, calibration is the only optical setup required. This section also includes an explanation of **Auto Frame** commands, the routine for constraining the width of the scan beam.

Calibration

When a **Calibrate** command is sent, all symbologies are enabled except PDF417[1] and Pharmacode.[2] The scanner looks for readable bar code symbols, and records the highest read rates it encounters while stepping through various settings for motor speed, laser power, fixed gain, and AGC level. If the The software evaluates the results and selects the best combination.

Setting up for Calibration

Position your bar code symbol at the distance used in your application and confirm that it is at a distance within the specifications for that symbol size (see **"Position Symbol and Scanner" on page 1-4**).

Calibration Methods

There are three ways to start calibration:

- ESP **Calibration** menu (**page 9-3**).
- Serial command **<@CAL>** (**page 9-3**).
- From the embedded calibration menu **<@>** (**page 9-4**).

1. Calibration does not function with PDF417 symbols. However, you can substitute a Code 128 symbol with the same mil size as your PDF417. When you do this, enable Code 128 and after calibration, switch back to PDF417.
2. **Note**: If using an I 2 of 5 label, verify that the number of characters in the label being scanned matches the code length enabled for the I 2 of 5 code type (default is 10 and 6). See **"Interleaved 2 of 5" on page 5-13**.

Calibration By ESP

1. In the **Apps Mode**, click the **Calibration** button on the icon bar at the top of ESP to open the calibration menu.
2. In the **Fixed Parameter Calibration** area you can select one or two parameters that you do NOT want to change. (Selecting all three will produce an error.)

   For example, you want to fix **Scan Speed** and **Laser Power**. Check the appropriate boxes and make your settings, as shown here:

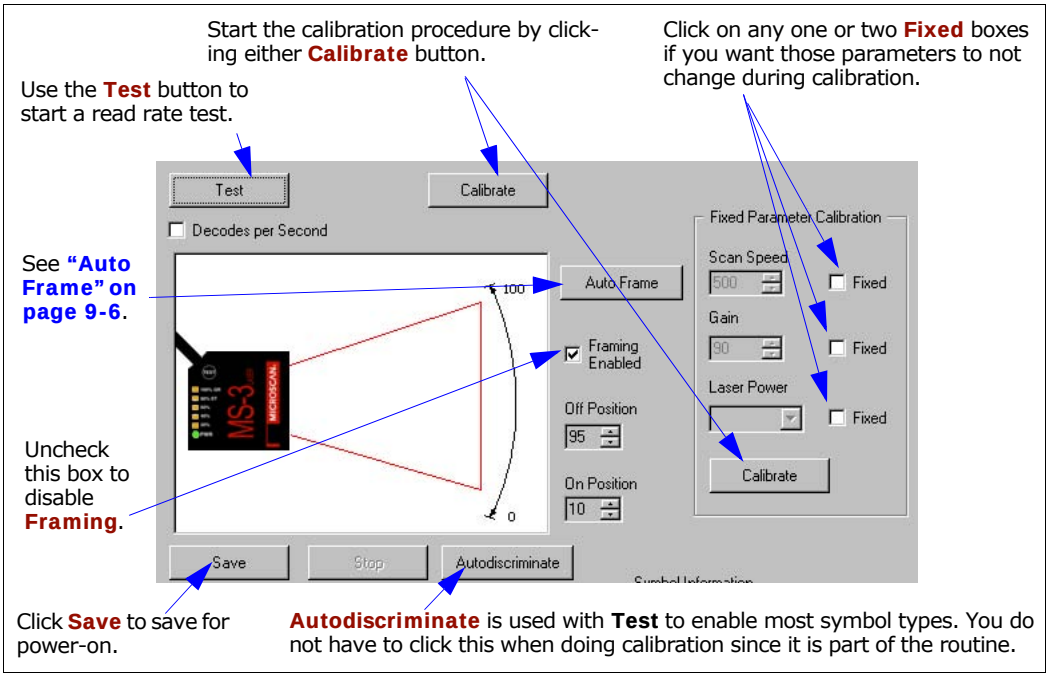

Start the calibration procedure by clicking either Calibrate button.
Click on any one or two Fixed boxes if you want those parameters to not change during calibration.
Use the Test button to start a read rate test.
See "Auto Frame" on page 9-6.
Uncheck this box to disable Framing.
Click Save to save for power-on.
Autodiscriminate is used with Test to enable most symbol types. You do not have to click this when doing calibration since it is part of the routine.
Test
Calibrate
Decodes per Second
Auto Frame
Framing Enabled
Off Position
On Position
Fixed Parameter Calibration
Scan Speed
Gain
Laser Power
Fixed
Calibrate
Save
Stop
Autodiscriminate
100
0
MS-3

Figure 9-7 Calibration Display

3. Wait for the calibration to cycle through the various settings looking for the best combination. A **Calibration Successful** message should eventually appear.
4. Click **Save** to save for power-on (same as a **<Z>** command).

Calibration by Serial Command

Send an **<@CAL>** command to optimize motor speed, laser power and gain level.
Send a **<Z>** or **<Zd>** command to save settings.

Calibration by Embedded Menu

To calibrate via the embedded **Calibration Setup Menu**, do the following:

1. Enter **Calibration** menu by sending an **<@>** command from a terminal. This may take a few seconds to generate.

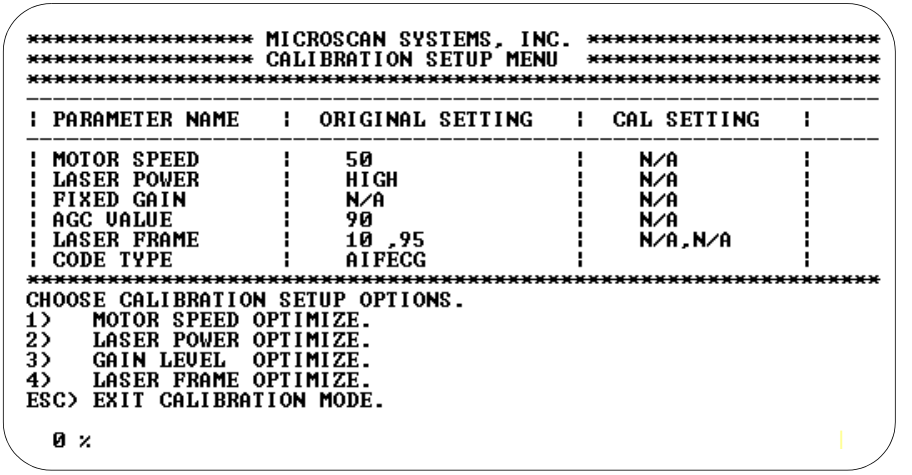

********** MICROSCAN SYSTEMS, INC. **********
********** CALIBRATION SETUP MENU **********
PARAMETER NAME | ORIGINAL SETTING | CAL SETTING
MOTOR SPEED | 50 | N/A
LASER POWER | HIGH | N/A
FIXED GAIN | N/A | N/A
AGC VALUE | 90 | N/A
LASER FRAME | 10 ,95 | N/A,N/A
CODE TYPE | AIFECG |
CHOOSE CALIBRATION SETUP OPTIONS.
1> MOTOR SPEED OPTIMIZE.
2> LASER POWER OPTIMIZE.
3> GAIN LEVEL OPTIMIZE.
4> LASER FRAME OPTIMIZE.
ESC> EXIT CALIBRATION MODE.
0 %

Figure 9-8 Embedded Calibration Setup Menu

2. Choose your calibration setup option:

   Enter **1** to optimize **Motor Speed**.

   Enter **2** to optimize **Laser Power**.

   Enter **3** to optimize **Gain Level**.

   Note: Doing all 3 of the above routines is the equivalent of sending the **<@CAL>** serial command or clicking **Calibrate** in the ESP **Calibration** display page.

   Enter **4** to do laser framing. This is the same as clicking the **Auto Frame** button in the **Calibration** display.

   Note: A user can abort calibration at any time by pressing the **ESC** key on the terminal. No other keystroke has any effect while in calibration.

3. Wait for the calibration routine to cycle through its settings.

   A **Calibration in Progress** message will be displayed. A new text line will appear below the menu displaying the progress of the calibration.

4. Exit the **Calibration Setup** menu.

   To exit the **Calibration Setup** menu, press the **ESC** key. The following prompt will be displayed:

   "DO YOU WANT TO USE CALIBRATION SETTINGS? (NOT SAVED) Y/N."

   Typing **Y** will cause the current settings in the **Calibration Setup** menu will cause the scanner to be reset without saving the settings for power-on.

   You will then be asked,

   DO YOU WANT TO SAVE THESE SETTINGS FOR POWER-ON? Y/N

   These settings include **Motor Speed**, **Gain**, **AGC Level**, **Laser Power** and **Laser Frame**.

   Typing **N** will cause the scanner to be reset without saving the settings for power-on.

Auto Frame

Auto Frame by ESP

In the **Calibration** menu you can also use the **Auto Frame** command to constrain the width of the scan beam. This is useful if extraneous markings interfere or slow down decoding. It works by setting the length of time the laser is ON during each scan so that only a selected portion of the scan width is effectively scanned.

1. In the **Apps Mode**, click the **Calibration** button on the icon bar at the top of ESP to open the calibration menu.

   In the Auto Frame portion of the display, note that in the default mode is **Framing Enabled** the **Off** position is set to **95** and the **On** position is set to **10**.

2. To adjust the scan width automatically, click on the **Auto Frame** button.

   The scanner will locate the start and stop characters and adjust the scan beam timing so that the scan width is constrained but still covers the entire symbol.

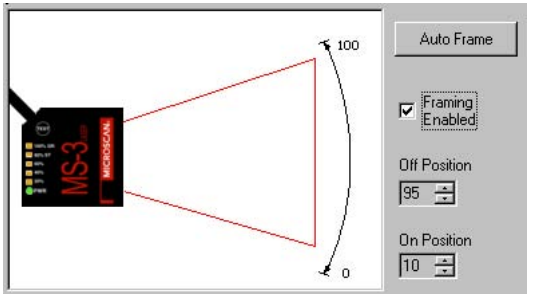


Figure 9-9 Auto Frame Defaults

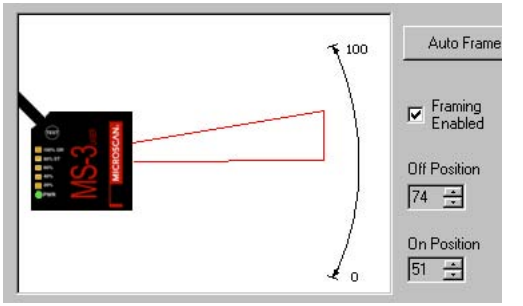


Figure 9-10 Constrained Scan Beam Wid

You can also adjust the framing manually by moving the **Off** and **On** selectors while visually observing the size of the scan beam.

Auto Frame by Embedded Menu

From the embedded menus, select **Scanner Setup 2**. From here you can use the **Laser On Position** %and **Laser Off Position %** to constrain the width of the scan beam.

```
                        CURRENT SETTINGS FOR SCANNER SETUP 2
------------------------------------------------------------------------
---
SCAN FRAMING              = ENABLED
LASER ON POSITION %       =  10
LASER OFF POSITION %      =  95
CODE 39                   = STANDARD RATIO
CODABAR                   = STANDARD RATIO
I 2 OF 5                  = STANDARD RATIO
CODE 93                   = STANDARD RATIO
```

Chapter

10

Terminal Mode

Chapter Contents

Terminal Window....10-2
Find Function....10-3
Macros....10-4
Terminal Window Functions....10-5

This section describes the terminal window and macro functions.

Note: The characters **NULL < >** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Note: You can learn the current setting of any parameter by inserting a question mark after the number, as in **<K100?>**. To see all "K" commands, send <K?>.

Terminal Window

To use the terminal mode, click on the **Terminal** button.

You will see the following window:

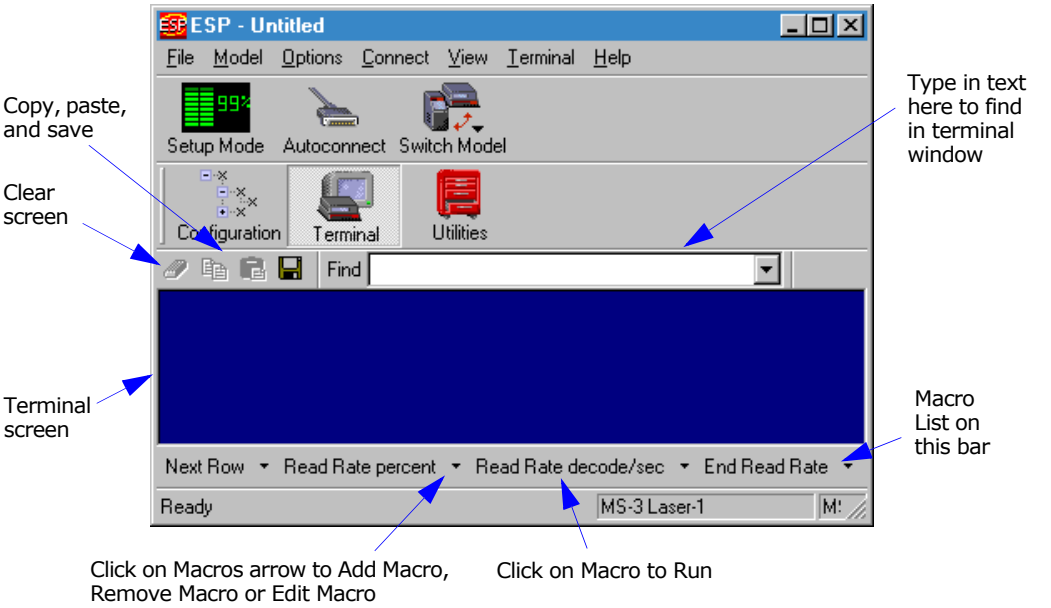


Figure 10-11 Terminal Window

The terminal screen allows you to enter serial commands (in **red**) from the macro box, by copying, or directly from your keyboard.

The terminal screen also displays bar code data or information from the reader (in **blue**).

You can also right click in the terminal screen to bring up a handy option box.

Find Function

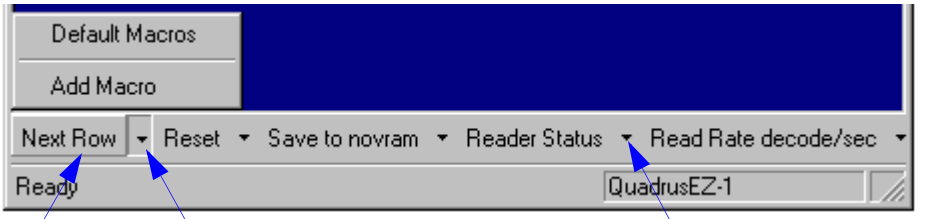
The **Find** box allows you to enter text strings to be searched for in the terminal window. For example a series of bar codes have been scanned into the terminal view and you want to determine if a particular bar code starting with ABC has been read.

1. Type **ABC** into the **Find** box.

2. Press **Enter**.
   The first instance of **ABC** will be high-lighted in the terminal window.
3. Press the **F3** key to search again for the next instance of **ABC**.
4. Press **Shift-F3** to search for the previous instance of **ABC**.

Macros

Macros can be stored in a macro selection bar, edited in a separate window, and executed by clicking on the macro name.



Click on **Next Row** to see the next row of macros

Click on the first arrow here to **Add Macro** or **Default Macros**. When you default macros, the entire macros set is restored to their original macro commands.

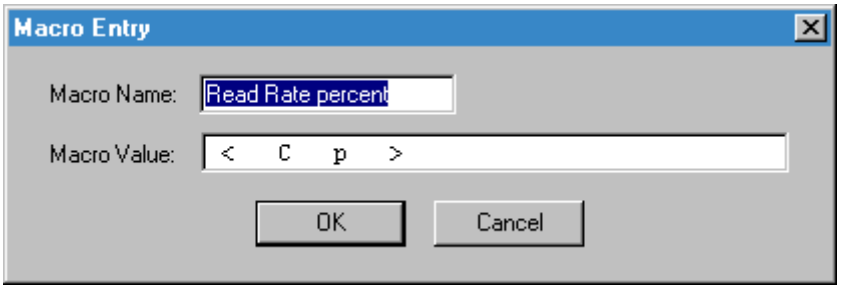
Click here to edit a macro.

When you click on the macro name, the macro is executed in the terminal window.

If this is a command, the command is also sent to the reader at the same time it is displayed.

Editing a Macro

When you click the arrow next to a any macro and select **Edit**, the following appears:



You can edit an existing macro or type in a new macro name and define it in the **Macro Value** text box. Click **OK**.

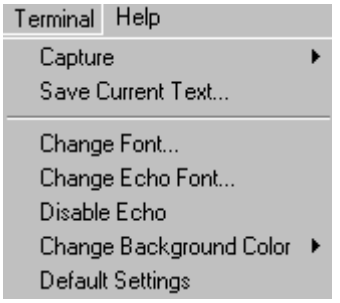
Terminal Window Functions

Right-click on the terminal window to display the following:

- **Copy** selected text to clipboard.
- **Paste** from terminal or computer text.
- **Clear** all text in terminal window.
- **Select All** text in the terminal window.
- **Save...** brings up a save as dialog box.
- **Change Font...** of data text, brings up a text dialog.
- **Change Echo Font...** to change typed in text or commands.
- **Change Background Color** of terminal window.
- **Default Settings** changes all the above back to default settings.

Terminal Pulldown Menu

The pulldown **Terminal** menu has **Capture and Save Current Text** as well as the functions defined above.



- **Capture** lets you append data in real time to a text file of your choice. While in operation, the text file cannot be opened. You can select **Pause** to interrupt the capture flow or **Stop** to end the flow and open the file.
- **Save Current Text...** saves all text in the terminal window to a text file of your choice.

Chapter 11

Utilities

Chapter Contents

Utilities by ESP Menu 11-2
Summary of Utilities Commands 11-3
Read Rate 11-5
Counters 11-6
Master Database 11-8
Digital Bar Code 11-11
Firmware 11-12
Device Control 11-13
Symbol Type 11-15
Defaulting/Saving/Resetting 11-16
Microscan Grading 11-17
Reader Status Requests 11-19

Utility commands are generally commands that are performed during reader operations to check read rates, determine read rates or perform miscellaneous operations on reader hardware. Serial utility commands are not prefaced with a "K" and a numeric code, nor do they require an initialization command (<A> and <Z>). They can be entered from within any terminal program or from within ESP in the **Terminal** window.

Note: You can learn the current setting of any parameter by inserting a question mark after the number, as in **<K100?>**. To see all "K" commands, send **<K?>**.

Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Utilities by ESP Menu

Click this button to bring up the **Utilities** menu

Utilities opens in the **Read Rate** utility. Click on the tabs to access other utilities.

Note: Utility commands are not accessible by embedded menus.

Summary of Utilities Commands

Table 11-2 Utilities Commands

Command Type	Command	Name
Read Rate	**<Cp>**	Enter Single Symbol Percent Rate Test
	<C>	Enter Single Symbol Decode Rate Test
	<J>	Exit Decode Rate and Percent Rate Test
Counter Request and Clear	**<N>**	Noread Counter
	<O>	Noread Counter Reset
	<T>	Trigger Counter
	<U>	Trigger Counter Reset
	<V>	Good Read/Match Counter
	<W>	Good Read/Match Counter Reset
	<X>	Mismatch Counter
	<Y>	Mismatch Counter Reset
Matchcode	**<E>**	Enable **Matchcode** (see also <**K223,**...> on **page 7-4**.)
	<F>	Disable **Matchcode** (see also <**K223,**...> on **page 7-4**.)
	<K224,*number of master symbols***>**	Set master symbol database size. Also <**KM***number of master symbols*>
	<)*data***)>**	Enter symbol data as master symbol #1.
	<**K231,***master symbol number***,***data***>**	Enter symbol data to specified master symbol. Also <**M***master symbol number***,***data*>
	<G>	Store next symbol scanned as master symbol #1.
	<**G***master symbol number***>**	Store next symbol scanned as specified master symbol.
	<)>	Request master symbol #1.
	<**K231,?>**	Request all master symbol information. Also **<M?>**
	<**K231,***master symbol number***?**>	Request specified master symbol information. Also **<M#?>**
	<**K231,** *master symbol number***,>**	Delete specified master symbol. Also <**M***master symbol number***,**>
	<))>	Delete Master Symbol # 1
	<K225,*status***>**	Enable/disable New master pin
Part Number/ Checksum	**<!>**	Display Checksums of EPROM Flash memory
	<!b>	Display Checksum for Boot Code
	<!a>	Display Checksum for Application Code
	<#>	Display Part Numbers
	<#b>	Display Boot Code Part Number
	<#a>	Display Application Code Part Number
Device Control	**<H>**	Enable Laser Scanning
	<I>	Disable Laser Scanning
	<K500> or **<KE>**	Motor On
	<K501> or **<KF>**	Motor Off
	<L1>	Programmable Output 1
	<L2>	Programmable Output 2
	<L3>	Programmable Output 3

Code Types	**<P>**	Autodiscriminate All Codes except Pharmacode and PDF417
	<Q>	Enable Code 39 Only
	<R>	Enable Codabar Only
	<S>	Enable I 2/5 Only
Trigger	**<char>**	Serial Trigger Character
Default/Reset/ Save	**<A>**	Reset (does not save for power-on)
	<Ard>	Reset and recall factory defaults
	<Arp>	Reset and recall power-on parameters
	<Arc>	Recall and recall customer default parameters
	<Z>	Save current settings for power-on
	<Zc>	Save current settings as customer default parameters
Status Requests	**<?>**	Scanner Status
	<?1>	Extended scanner status
	<K?>	Configuration status

Note: Utility commands are not accessible by embedded menus.

Read Rate

When in a read rate mode, the scanner will output a number preceding the symbol data. This number will represent either the number of decoded scans per second or the percentage of successful decoder per total number of scans.

Make a note of the decode rate. It will be a useful reference when calculating the number of decodes (see **"Formulas for Number of Decodes" on page A-46**).

Read Rate by ESP

You can access **Read Rate** from the **Utilities** menu. To start or end a read rate test, right-click **Read Rate** and select **Start** or **Stop**.

To change from percent read rate to decodes per second, first end the read rate by selecting **Stop**, then right-click and select **Decodes/Sec**.

Read Rate by Serial Command

Enter Single Symbol Decodes/Second Test

Sending **<C>** instructs the scanner to transmit the decodes per second and symbol data (if any). The decode rate can vary dramatically due to the angle and location of the symbol in relation to the scan line. This test is very useful in aligning and positioning the scanning device during installation.

Enter Single Symbol Percent Test

Sending **<Cp>** instructs the scanner to transmit the percentage of decodes and any scanned symbol data.

End Read Rate Test

Sending **<J>** ends both the **Percent** test and the **Decodes/Second** test for both single and multi-symbol.

Counters

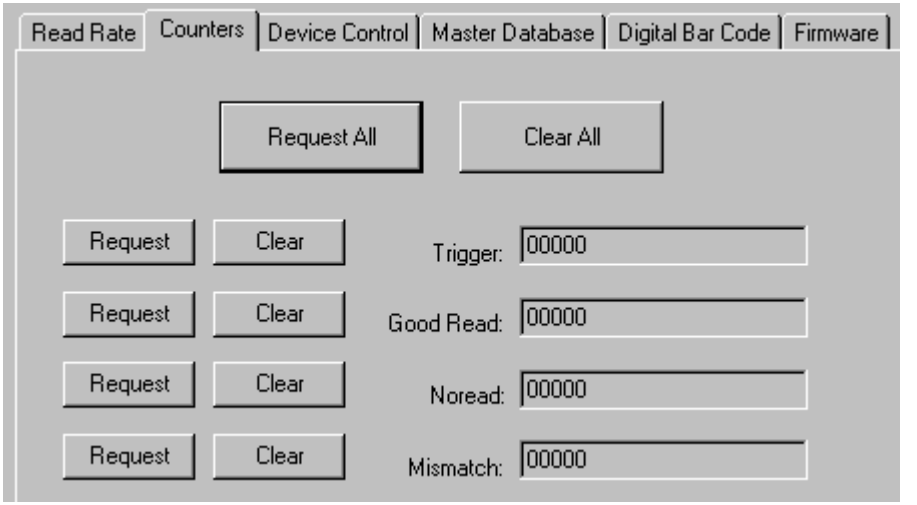
Counter commands can be a numeric value from 00000 to 65,535. After reaching the maximum numeric limit of 65,535, the counter will automatically roll-over and start counting again at 00000. To obtain the cumulative total of counts after the roll-over has occurred, add 65,536 per each roll-over (the scanner does not keep track of the number of roll-overs) to the current count.

Note: All counter values will be lost if power is recycled to the scanner or the scanner receives a reset or save command.

Counter by ESP

You can access **Counters** from the **Utilities** menu.

Right-click the appropriate counter option and select **Request** to display count or **Clear** to set counter to zero. Or, right-click on **Counters** and select **Request All**.



Counters by Serial Command

Noread Counter

Sending **<N>** displays the total number of noreads that have occurred since the last reset.

Noread Counter Reset

Sending **<O>** sets Noread Counter to 00000.

Trigger Counter

Sending **<T>** displays the total number of triggers since the last reset.

Trigger Counter Reset

Sending **<U>** sets the trigger counter to 00000.

Good Read/Match Counter

Sending **<V>** displays the total number of good reads matching the master symbol if **Matchcode** is enabled. This counter is always enabled, but will only work as a match count when **Matchcode** is enabled. If **Matchcode** is not enabled, this counter records the number of good reads. This count can be requested at any time.

Good Read/Match Counter Reset

Sending **<W>** sets the match counter to 00000.

Mismatch Counter

With **Matchcode** enabled, sending **<X>** displays the number of decoded symbols since the last reset that do not match the master symbol.

Mismatch Counter Reset

Sending **<Y>** sets the mismatch counter to zero.

Master Database

Important: **Master Symbol Database** is used only for comparing entire bar codes, when **Sequential** and **Wild Card** are NOT enabled, and **Start Position** is equal to **0**.

Usage: Useful where more than one master symbol is required, as in a **Multi-symbol** setup, for matching and other matchcode operations.

Definition: Allows you to define up to 10 master symbols as the master symbol database, which can be entered by keyboard, scanned in, displayed, or deleted by serial or ESP commands.

Master Symbol Database Size

Definition: **Master Symbol Database Size** allows you to select 1 to 10 master symbols for the master symbol database.

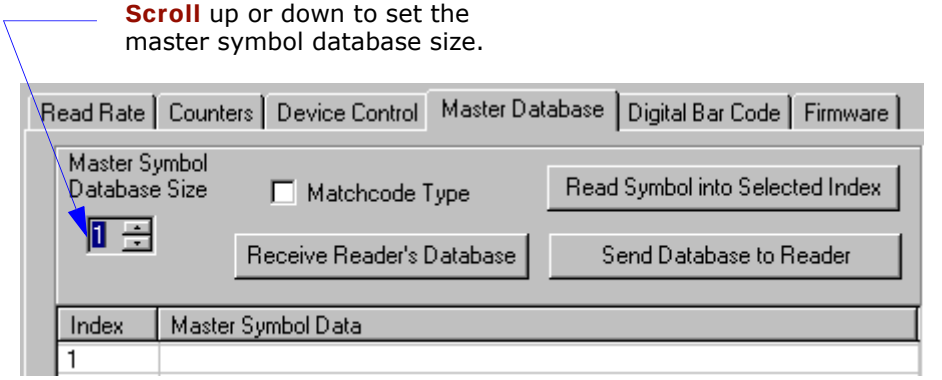
Serial Cmd: <**K224,*number of master symbols***>

Default: **1**

Options: 1 to 10

To access in ESP

1. Click the **Utilities** button and click the **Master Database** tab.
2. Click the **Matchcode Type** checkbox to enable **Matchcode**.
3. Set the number of master symbols you want to include.

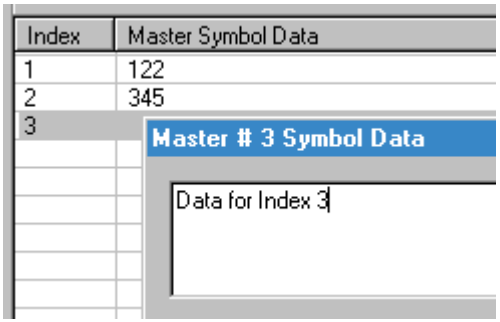


Enter Master Symbol Data

Definition: Allows you to enter master symbol data for a specific master symbol index number (1 to 10), provided the index number is not larger than the number of symbols enabled by the **Master Symbol Database Size** (see **page 11-8**). For example, if **Master Symbol Database Size** is set to 2, you will not be able to enter data for symbols 3 through 10.

ESP:

1. **Double-click** on each index number you want to setup and copy or type in your data in the popup data entry box.
2. Click on the **Send Database to Reader** button.



Note: You can also click **Receive Reader's Database** to enter the scanner's current database settings or click **Read Symbol into Selected Index** to enter the data from a symbol that is in the scanner's read range.

Serial Cmd: <**K231,*master symbol number*,*master symbol data***>

Default: **1, *blank***

Options: 1 to 10, any combination of ASCII text up to the maximum indicated in **"Maximum Characters for Master Symbol Database" on page 11-10**.

For example, to enter data for master symbol 9, after making certain that master symbol database size is enabled for 9 or more symbols (see **"Master Symbol Database Size" on page 11-8**), send <**K231,9,*data***>.

Caution: Since the total number of characters available for the master symbol database is **128**, changes to the **Master Symbol Database Size** will re-allocate the number of characters available for each master symbol and could cause existing master symbols to be deleted (except master symbol #1 unless it also exceeds the size limitation).

Table 11-3, "Maximum Characters for Master Symbol Database," on page 11-10 specifies the maximum number of characters available to each symbol according to the number of master symbols defined, from 1 through 10. See **"Master Symbol Database Size" on page 11-8.**

Table 11-3 Maximum Characters for Master Symbol Database

Master Symbol Number	Maximum Characters
#1	127
#2	62
#3	39
#4	28
#5	20
#6	15

Note: See **Chapter 7, "Master Symbol Database"** for information on master symbol database and related commands.

Store Next Symbol as Master Symbol

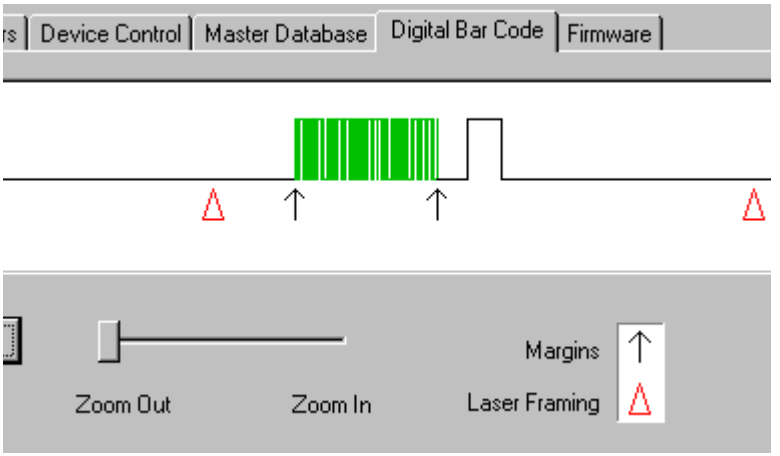
Definition: After you've set the size in the database, you can order the scanner to scan-in the next symbol as master symbol 1.

Serial Cmd: <**G*master symbol number***>

To store the next symbol scanned as master symbol #1 send: **<G>** or **<G1>**. For all symbols numbers except 1, the number must be included.

Options: 1 to 10

Digital Bar Code



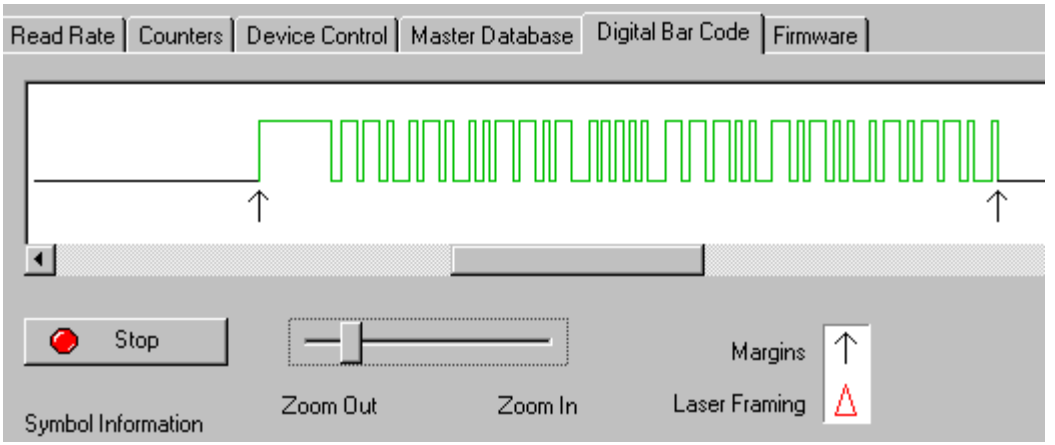
When you click the **Digital Bar Code** tab and the **Start** button, a digitized representation of the symbol in front of the scanner will appear.

This routine is useful for conveying a sense of the symbol's readability and graphically indicating bad or unreadable portions of symbols, extraneous "noise," etc. A green waveform indicates a decoded symbol; a red waveform indicates an undecoded symbol or other object.

The read triangles represent the width of the scan beam relative to the symbol. The upward pointing arrows indicated the symbol's margin.

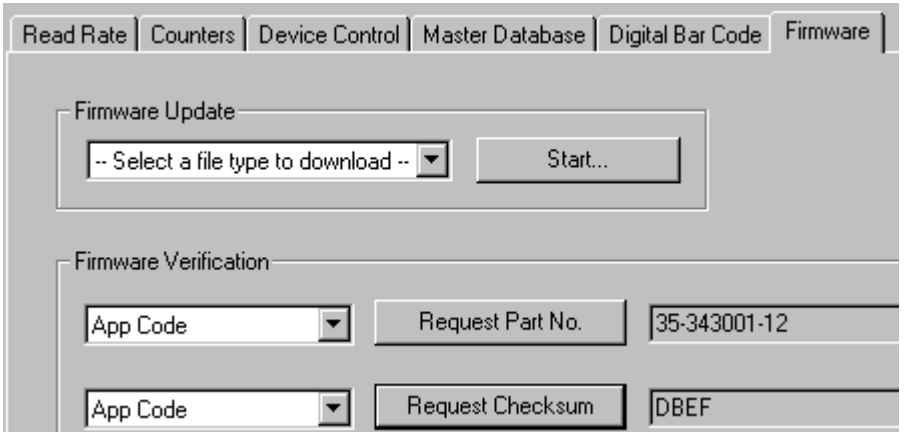
Zoom In, Zoom Out

You can zoom in by sliding the **Zoom** lever to the right. You may have to scroll right or left to locate your symbol, but the results will be striking.



Firmware

Firmware Update is used to download application code to the reader.



Application code versions are specific to your reader. Consult with your sales representative before downloading application code. If needed, an application code will be sent to you in the form of a ***.mot** file.

To download application code:

1. First make sure the host is connected to your reader.
2. Apply power to the reader.
3. In the **Firmware Update** pulldown window, select **App Code**.
   This will open a file dialog box.
4. Navigate to the appropriate file (a ***.mot** file) and open the file.
5. Allow a minute or so for the firmware to download.

As application code begins to download to the reader, the reader will go silent, the reader's RDY and GD/RD LEDs will flash intermittently, and a progress indicator at the bottom of the ESP window will let you know when the download is complete.

Caution: Do not interrupt power or disconnect the host cable while download is in progress.

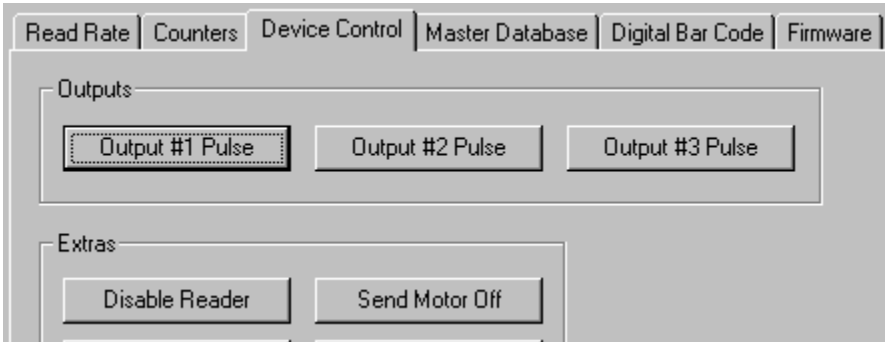
Firmware/Checksum Verification

From **Firmware Verification** you can request the part number and checksum from by selecting **App Code** or **Boot Code** and clicking the accompanying **Request...** button.

Device Control

Outputs

You can access **Device Control** from the **Utilities** menu.



Output # 1 Pulse

Definition: Activates the link between Output 1(+) and Output 1(–) of the host connector for the duration set by **"Pulse Width" on page 6-19**. (regardless of Master Symbol or Output 1 status).

ESP: Click **Output # 1 Pulse** to activate.

Serial Cmd: <**L1**>

Output # 2 Pulse

Definition: Activates the link between Output 2(+) and Output 2(–) of the host connector for the duration set by **"Pulse Width" on page 6-19**. (regardless of Master Symbol or Output 2 status).

ESP: Click **Output # 2 Pulse** to activate.

Serial Cmd: <**L2**>

Output # 3 Pulse

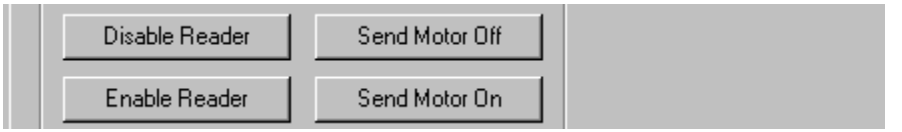
Definition: Activates the link between Output 3(+) and Output 3(–) of the host connector for the duration set by **"Pulse Width" on page 6-19**. (regardless of Master Symbol or Output 3 status).

ESP: Click **Output # 3 Pulse** to activate.

Serial Cmd: <**L3**>

Extras

You can access **Device Control** from the **Utilities** menu



Disable Reader

Usage: This feature is useful during extended periods of time when no symbols are being scanned or the reader is being configured.

Definition: Sending **<I>** will turn the laser off and end the current read cycle.

ESP: Click **Disable Reader** button.

Serial Cmd: **<I>**

Disabling laser scanning will not affect any downloaded commands to the reader.

Enable Reader

Definition: Causes the laser scanner to be on continuously.

ESP: Click **Enable Reader** button.

Serial Cmd: **<H>**

Note: Enable / Disable Reader does not relate to **Laser On / Off** command.

Send Motor Off

Usage: This feature is useful during extended periods of time when no symbols are being scanned or the reader is being configured.

Definition: Turns the spinning mirror off (if not already running).

ESP: Click **Send Motor Off** button.

Serial Cmd: **<KF>**

Send Motor On

Usage: This feature is useful during extended periods of time when no symbols are being scanned or the reader is being configured.

Definition: Turns the spinning mirror on (if not already running).

ESP: Click **Send Motor On** button.

Serial Cmd: **<KE>**

Symbol Type

Sending **<P>** enables the scanner to decode all available symbol types except Pharmacode and PDF417 without changing scanner configuration.

Sending **<Q>** enables the scanner to decode Code 39 symbols without changing scanner configuration.

Sending **<R>** enables the scanner to decode Codabar symbols without changing scanner configuration.

Sending **<S>** enables the scanner to decode I 2 of 5 symbols without changing scanner configuration.

Defaulting/Saving/Resetting

Table 11-4 Software Reset/Save/Recall Commands

<A>	Reset (does not save for power-on)
<Ard>	Reset and recall Microscan defaults
<Arp>	Reset and recall power-on parameters
<Arc>	Reset and recall customer default parameters
<Z>	Save current settings for power-on
<Zc>	Save current settings as customer default parameters
<Zrd>	Recall Microscan default parameters and save for power-on
<Zrc>	Recall customer parameters and save for power-on

See **Appendix G — "Defaulting/Saving/Resetting" on page A-20** for complete explanation on resets, saves and defaulting.

Microscan Grading

Microscan grading informs the user how the scanner perceives a symbol it is scanning. Except for special circumstances, the slower the scan speed and the closer the symbol is to the focal point, the more accurate the results.

The grading feature is available for the following symbologies: Code 39, Codabar, Code 128, I-2/5, and Code 93.

Command Format

<GRADE,xx.xx> where xx.xx is the symbol length in inches with up to two digits in front of the decimal point and two digits behind the decimal point.

Example: Send **<GRADE,01.50>** for a symbol 1.5 inches in length.

Operation

Once the command has been sent, the scanner will enter a user test mode for up to two full seconds. During this time the scanner will attempt to complete ten decodes of the same-symbol. If this occurs, the scanner will output the grading information for this symbol.

Microscan Grading Output

Example:

```
Symbol Type: Code 39
Symbol Direction: Forward
Symbol Length: 4
Symbol Data: 880G
Check Character: Modulus 43
Decodability: 48%
W/N Ratio: 2.7
Avg. Narrow Bar: 0.0164"
Avg. Bar Error: +21%
Inter-Character Gap: 0.0166"
Margin: >50%
```

The following information is output:

- **Symbol Type** - The type of symbol decoded.
- **Symbol Direction** - The direction of the symbol presented to the scanner.
- **Symbol Length** - The length of the symbol data encoded.
- **Symbol Data** - The data encoded in the symbol.
- **Check Character** - Displays the check digit type that the scanned symbol complies with. If the symbol does not comply, then the scanner outputs "Failed."

- **Decodability** - Calculates the decodability of the symbol using the video acquired by the reader. The calculations are consistent with ANSI X3.182-1990 however the it is important to note the measurements used to acquire the symbol information are proprietary and are not ANSI compliant.
- **W/N Ratio** - Calculates the wide to narrow ratio of the symbol using the video acquired by the reader. The calculations are consistent with ANSI X3.182-1990 however the it is important to note the measurements used to acquire the barcode information are proprietary and are not ANSI compliant.
- **Average Narrow Bar** - Calculates the wide to narrow ratio of the symbol using the video acquired by the reader. The calculations are consistent with ANSI X3.182-1990 however the it is important to note the measurements used to acquire the barcode information are proprietary and are not ANSI compliant.
- **Average Bar Error** - Calculates the average bar error in relation to the spaces and the average narrow element. This is a good representation of the amount of over or under printing.
- **Intercharacter Gap** - Measures the largest intercharacter gap within the symbol. If the symbol does not have intercharacter gaps then N/A is output.
- **Margin** - Measures the size of the smallest margin around the symbol.

Reader Status Requests

<?> Scanner Status Byte

The scanner responds to a status request **<?>** with a two character hex value, for example **<?/22>**. To determine the status:

1. Look up the binary conversion in **Table 11-5**.

   For example, the first **2** in binary would be **0 0 1 0** as read from binary digits 3 through 0; the second **2** the binary digits 7 through 4 which is also **0 0 1 0**.

2. Next, enter your binary values in **Table 11-6** in the "Binary" column next to the appropriate bit.

Table 11-6 MS-3 FIS-0003 Laser Scanner Status

Bit	Binary	Scanner Status
0	***0***	Command error (last command received)
1	***1***	Command received
2	***0***	Communication error
3	***0***	Novram read/write error
4	***0***	Motor timeout error OR scanning disabled
5	***1***	Scanner is in a read cycle
6	***0***	Software Watch dog reset
7	***0***	Hardware Watch dog reset

3. Under "Binary," interpret ***1***s as true and the ***0***s as not true. For example, bit 1 has a ***1*** in the "Binary" column, indicating "Command Received." Bit 5 is also a ***1*** indicating that the "Scanner is in a read cycle."

Table 11-5 Hex Value to Binary Conversion

Hex Value	Binary Bit Digits			
	7	***6***	***5***	***4***
	3	***2***	***1***	***0***
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
A	1	0	1	0
B	1	0	1	1
C	1	1	0	0
D	1	1	0	1
E	1	1	1	0
F	1	1	1	1

<?1 > Extended Status

The scanner responds to an extended status request **<?1>** with several fields, for example: **<?/F><?1/35-338200-12,35-338201-14,476C,33,33>**.

These represent: the status byte discussed above, the boot part number (**35-338200-12**), the application part number (**35-338201-14**), the fpga part number (**5-559001-18**), flash checksum (**476C**), current RAM parameter checksum (**33**), and flash parameter checksum (**33**).

<K?> Configuration Command Status

Returns the current status of all configuration commands.

Appendices

Appendix A General Specifications A-2
Appendix B Electrical Specifications A-5
Appendix C Serial Configuration Commands A-6
Appendix D Serial Command Format A-9
Appendix E ASCII Table A-11
Appendix F Defaulting/Saving/Resetting A-13
Appendix G Symbol Configuration A-15
Appendix H Object Detector A-17
Appendix I Formulas for Number of Decodes A-18
Appendix J Operational Tips A-21
Appendix K Interface Standards A-22
Appendix L Multidrop Communications A-23
Appendix M Troubleshooting A-28
Appendix N Glossary of Terms A-30

Appendix A — General Specifications

Mechanical

Height (Standard):	0.85” (21.6 mm)
Width (Standard):	1.75” (44.5 mm)
Depth (Standard):	1.75” (44.5 mm)
Weight (Standard):	2.0 oz. (57 g)
Height (Right-Angle):	0.90” (22.9mm)
Width (Right-Angle):	2.25” (57.2mm)
Depth (Right-Angle):	2.40” (61.0mm)
Weight (Right-Angle):	3.5 oz. (135 g)

Environmental

Enclosure rating: IP54, category 2
Operating temperature: 0° to 50°C (32° to 122°F)
Storage temperature: –30° to 60°C (–22° to 140°F)
Humidity: Up to 90% (non-condensing)
Operating Life: 40,000 hours at 40°C

CE Mark

General Immunity for light industry:
EN 55024: 1998 ITE Immunity Standard
Radiated and Conducted Emissions of ITE Equipment:
EN 55022:98, ITE Disturbances.

Optics

Semiconductor, visible laser diode (650nM nominal); CDRH Class II

Scanning Parameters

Options: Single line, fixed raster
Scan rate: Adjustable from 300 to 1000 scans/second; default = 500 sps
Scan width angle: >70°
Pitch: ±50° maximum
Skew: ±40° maximum
Symbol contrast: 25% min. @ 650nM

Connector

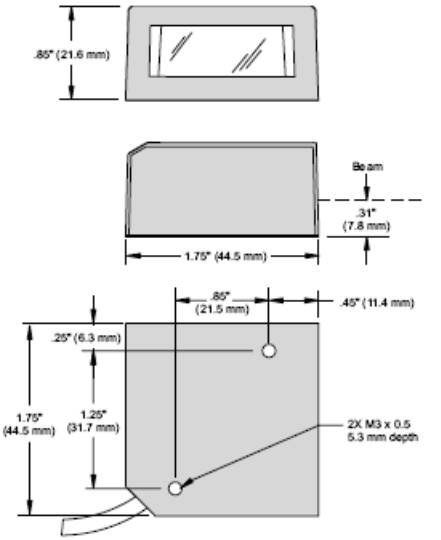
3 ft. (914mm) cable terminated with 15-pin D-sub socket connector

Electrical

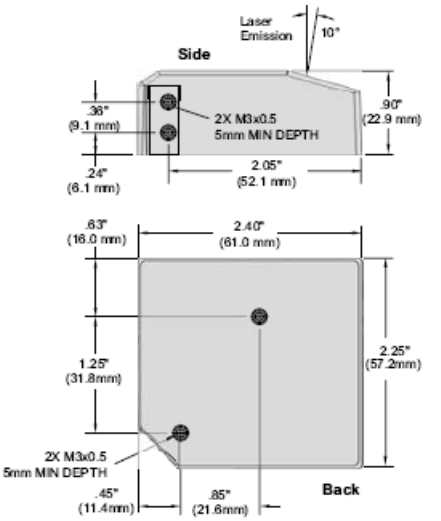
5VDC ±5%, 200mV p-p max. ripple, 260mA @ 5VDC (typical)

Discrete I/O

Trigger Input: 3 to 24V rated (1mA @ 5 VDC)
New Master: 3 to 24V rated (1mA @ 5VDC)
Outputs (1, 2, 3): 5V TTL compatible, can sink 10 mA and source 2 mA.



MS-3 Laser Scanner



MS-3 Integral Right Angle Laser Scanner

Symbologies

Standard: Code 39, Code 128, I 2/5, Codabar, Code 93, UPC/EAN, Pharmacode
Special option: PDF417

Indicators

Beeper: Good Read, Match/Mismatch, Noread, On/Off
LEDs: 1 status, 1 power, 5 read performance (representing the percentage of decodes).

LED	State	Status
Power	Green On	Scanner has power
Ready/80%	Amber On	Scanner is in read cycle
GD/RD/100%	Amber On	Good Read

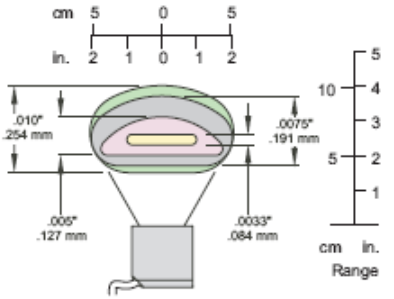
Safety Certifications

CDRH, FCC, UL/cUL, CE, BSMI (compliant)

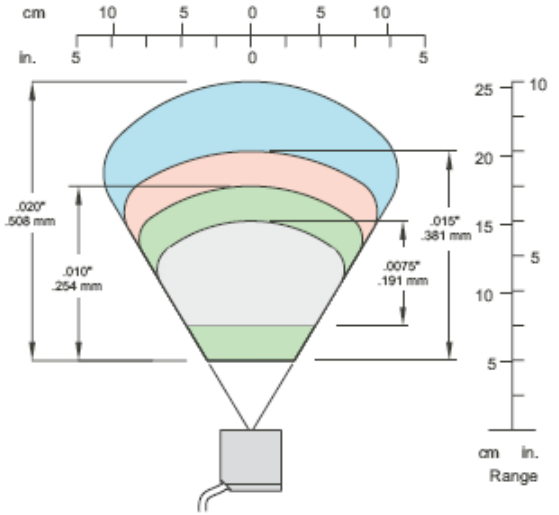
RoHS/WEEE Compliant

©2015 Microscan Systems, Inc.
All rights reserved. Specifications subject to change.
Product specifications are given for typical performance at 25°C (77°F) using grade A labels. Performance characteristics may vary at high temperatures or other environmental extremes. Warranty–One year limited warranty on parts and labor. Extended warranty available.

Read Ranges



High Density



Low Density

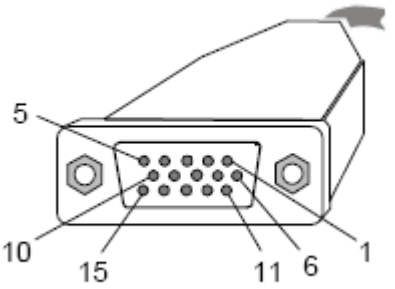
Narrow Bar Width	High Density
.0033” (0.84 mm)	2.3” to 2.6” (58 to 66 mm)
.005” (.127 mm)	2” to 3.1” (51 to 79 mm)
.0075” (.191 mm)	1.7” to 3.7” (43 to 94 mm)
.010” (.254 mm)	1.5” to 4” (38 to 102 mm)

Narrow Bar Width	Low Density
.0075” (.191 mm)	3” to 6” (76 to 152 mm)
.010” (.254 mm)	2” to 7” (51 to 178 mm)
.015” (.381 mm)	2” to 8” (51 to 203 mm)
.020” (.508 mm)	2” to 10” (51 to 254 mm)

Appendix B — Electrical Specifications

Maximum Operating Power: 2W
Power Input: 5VDC ±5%, 200mV p-p max. ripple, 260 mA @ 5VDC (typical)
Trigger, Input 1, New Master: 5 to 28 VDC rated (optoisolated)
Outputs (1,2,3): 1 to 28VDC rated (optoisolated) (I_{CE} <100mA @24VDC, current limited by user)

Pin	Host RS-232	Host & Aux. RS-232	Host RS-422/485	In/Out
1	Power +5VDC			In
2	TxD	TxD	TxD (-)	Out
3	RxD	RxD	RxD (-)	In
4	Power/Signal Ground			
5	NC			
6	RTS	Aux. TxD	TxD (+)	Out
7	Output 1 TTL (can sink 10mA and source 2mA)			Out
8	Default Configuration (NPN)			In
9	Trigger (NPN)			In
10	CTS	Aux. RxD	RxD (+)	In
11	Output 3 TTL (can sink 10mA and source 2mA)			Out
12	New Master Pin (NPN)			In
13	Chassis Ground			
14	Output 2 TTL (can sink 10mA and source 2mA)			Out
15	NC			



Caution:

1. Be sure all cables are connected **BEFORE** applying power.
2. Always power down **BEFORE** disconnecting any cables.

Appendix C — Serial Configuration Commands

The following table is a list of all the available serial configuration commands (also called "K commands"). These commands are also listed at the beginning of each applicable chapter.

Command Title	Format
Communications	
Password Status	<**K732,***status*>
Password Entry, Change	<**K733,***password,new password*>
Host Port Connections	<**K100,***baud rate,parity,stop bits,data bits*>
Host Protocol	<**K140,**protocol>
Host RS-422 Status	<**K102,***status*>
Auxiliary Port Parameters	<**K101,***aux port mode,baud rate,parity,stop bits,data bits,daisy chain status,daisy chain ID*>
Preamble	<**K141,***status,preamble*>
Postamble	<**K142,***status,postamble*>
LRC	<**K145,**status>
Intercharacter Delay	<**K144,**intercharacter delay>
Read Cycle	
Multisymbol	<**K222,**number of symbols,multisymbol separator>
Trigger Mode	<**K200,**trigger mode,trigger filter duration>
External Trigger State	<**K202,**external trigger state>
Serial Trigger Character	<**K201,**serial trigger character>
Start Serial Trigger Character	<**K229,***start trigger character*>
Stop Serial Trigger Character	<**K230,***stop trigger character*>
End of Read Cycle	<**K220,***end of read cycle mode*,read cycle timeout>
Decodes Before Output	<**K221,***number before output,decodes before output mode*>
Automatic Gain Control	<**K504,***gain level,AGC sampling mode,AGC min,AGC max*>
Scan Speed	<**K500,***scan speed*>
Symbol Detect/Transition	<**K505,***symbol detect status,transition counter*>
Maximum Element	<**K502,***maximum element*>
Scan Width Enhance	<**K511,***scan width enhance*>
Laser Setup	<**K700,***laser on/off status,laser framing status,laser on position,laser off position,laser power*>
Symbologies	
Code 39	<**K470,***status,check digit status,check digit output status,large intercharacter gap,fixed symbol length status,default symbol length,full ASCII set*>

Code 128	<**K474,***status,fixed symbol length status,fixed symbol length,EAN-128* status,*output format,application record separator status,application record separator character,application record brackets,application record padding*>
Interleaved 2 of 5	<**K472,***status,check digit status,check digit output status,symbol length #1,symbol length #2,guard bar status,range mode*>
Codabar	<**K471,***status,start & stop match status,start & stop output status,large intercharacter gap,fixed symbol length status,symbol length,check digit type,check digit output status*>
UPC/EAN	<**K473,***UPC status,EAN status,supplementals status,separator status,separator character,supplementals type,UPC-E output as UPC-A*>
Code 93	<**K475,***status,fixed symbol length status,fixed symbol length*>
Pharmacode	<**K477,***status,fixed bar length status,fixed bar length,min. no. of bars,bar widths,direction,fixed threshold value*>
PDF417 (special)	<**K476,***status,[unused],fixed symbol length status,fixed symbol length,decode at end of read cycle*>
Narrow Margins/Symbology ID	<**K450,***narrow margins status,symbology identifier status*>
Background Color	<**K451,***background color*>
I-O Parameters	
Symbol Data Output	<**K705,***symbol data output mode,when to output*>
Noread Message	<**K714,**status,noread message>
Bad Symbol Message	<**K715,***bad symbol status,bad symbol message*>
No Symbol Message	<**K716,***no symbol status,no symbol message*>
Beeper	<**K702,**beeper output>
Partial Output	<**K703,***partial output status,start position,length*>
Serial Verification	<**K701,**serial command echo status,serial command beep status,control/hex output>
EZ Button	<**K770,***global status,default on power-on*>
Output 1 Parameters	<**K810,***output on,active state,pulse width,output mode*>
Trend Analysis (Output 1)	<**K780,***trend analysis mode,trigger evaluation period,number to output on,decodes/trigger threshold*>
Diagnostics (Output 1)	<**K790,***over temperature,service threshold,[unused],laser current high,laser current low,low temp*>
Output 2 Parameters	<**K811,***output on,output state,pulse width,output mode*>
Trend Analysis (Output 2)	<**K781,***trend analysis mode,number of triggers,number to output on,decodes/trigger threshold*>
Diagnostics (Output 2)	<**K791,***over temperature,service threshold,unused,laser current high,laser current low,low temp*>
Output 3 Parameters	<**K812,***output on,output state,pulse width,output mode*>
Trend Analysis (Output 3)	<**K782,***trend analysis mode,number of triggers,number to output on,decodes/trigger threshold*>
Diagnostics (Output 3)	<**K792,***over temperature,service threshold,unused,laser current high,laser current low,low temp*>

Quality Output	<**K704,***quality output separator,decodes/trigger status,decode direction status*>
Matchcode	
Matchcode Type	<**K223,***matchcode type,sequential matching,match start position*,match length,wild card character,sequence on noread,sequence on mismatch>
New Master Pin	<**K225,**status>
Master Symbol Database Size	<**K224,**number of master symbols>
Matchcode Enable	<**K223,***status*>
Enter Data to Database	<**K231,***master symbol number,master symbol data*>
Request Master Symbol Info	<**K231?,***master symbol number*>
Request All Master Symbol Info	<**K231,?**>
Delete Master Symbol	<**K231,***master symbol number,*>
Store Next Symbol as Master	<**G***master symbol number*>
Diagnostics	
Counts, Power-on/Resets	<**K406,**power-on,resets,power-on saves,custom default saves>
Hours Since Last Reset	<**K407?**> *(read only--returns: hours,minutes)*
Warning Messages	<**K400,** *warning message status,laser high status,laser low status,novram/reset warning status*>
Laser High/Low	<**K411,***laser high status,laser high message,laser low status,laser low message*>
Service Message	<**K409,***status,service message,threshold,resolution*>

Serial Communication Programs

You can send serial commands from your terminal window in **ESP**. You can also use a terminal program such as Hyperterminal to send serial commands from your PC to the scanner.

From your PC host computer, you can ini-tiate communications with the scanner by with a terminal communications program such as Hyperterminal™ provided in the Windows™ operating system.

In order to communicate with the scanner, you will need to use the following commu-nications settings:

Baud = **9600**

Parity = **Even**

Stop Bits = **One**

Data Bits = **Seven**

Flow Control = **None**

Appendix D — Serial Command Format

Serial commands are of two types: utility and configuration.

Rules that apply to both utility and configuration commands

- A less than **<** and greater than **>** characters enclose the commands unless non-delimited commands are used. (See **"Trigger Mode"** on page 4-6.)
- Commands and data are “case sensitive.” That is, characters must be entered as upper or lower case, as specified.

Serial Utility Commands

These are sent during operations and are not followed by **<A>** or **<Z>**.

Serial Configuration “K” Commands

These begin with a single **K** character followed by a three digit numeric, a comma, data fields separated by commas, and typically, an initializing command, as follows:

<**K**three digit numeric,data,data,...etc.><initializing command>[1]

An initializing command of type “**A**” (not saved to non-volatile memory) or type “**Z**” (saved to non-volatile memory) may follow the command.

For example, to enable **UPC** and save the change for power-on, send: **<K473,*1*><Z>**.

To change **Baud Rate** and reset without saving changes for power-on, send **<K100,3><A>**.

Serial Configuration Command Conventions:

- All data fields (except the last) must be followed by a comma (without a space).
- The following characters cannot be used: **,** **<**, **>**, and **NULL**.
- All fields preceding a modified field must be included.
- If there is no change in preceding fields, then commas alone can be entered in these fields. For example, if only the last field in the following command is changing, **<K100,4,1,0,0>** can be entered as **<K100,,,0>**.
- All fields following a modified field can be omitted. For example, to change **Baud Rate**, send **<K100,*3*>**.

1. Many K command will automatically be saved for power-on.

Concatenating Configuration Commands

Commands can be concatenated (added together) in a single string or data block.

Serial Command Status Request

To ensure that any command was received and accepted, you can send the **Show Scanner Status** command: **<?>**.

The status of a specific serial command can be requested by entering the command followed by a question mark, for example **<K101?>**. To see all K commands, send a **<K?>** command.

With the FIS-0003, each K command is framed with a preamble and postamble and may be mixed with bar code symbol data. To prevent this, send an **<I>** command to disable scanning before sending the K request. Follow the K request with an **<H>** command to restore scanning.

Entering Special Characters in Serial Commands

To enter control characters within a serial command, hold down the control key while typing the desired character.

Entering Special Characters in Embedded Menus

Control Characters

Control characters entered on the command line are displayed in the menu as mnemonic characters, such as: **<CR><LF><NUL><NUL>**.

Press **SP** (the space bar) once, then enter the control character by holding down the control key and simultaneously pressing the desired character. For example to define a line feed, press **SP**, then **Control** and **J** simultaneously. It is displayed as **^J** on the command line and as **<LF>** in the menu when the screen is refreshed.

To Define a Carriage Return as a Character

Press **SP**, then **CR**. It is displayed as **^M** on the command line and as **<CR>** in the menu when the screen is refreshed.

To Define a Space as a Character

Press **SP** twice. It is displayed as a blank space in the menu when the screen is refreshed. While it appears that nothing has been assigned, the hex value 20 will be sent during data transmission.

To Select NUL as the Character

Press **SP**, then a **0** (zero). It is displayed as **<NUL>** in the menu when the screen is refreshed.

Appendix E — ASCII Table

Dec	Hex	Mne	Ctrl
00	00	NUL	^@
01	01	SOH	^A
02	02	STX	^B
03	03	ETX	^C
04	04	EOT	^D
05	05	ENQ	^E
06	06	ACK	^F
07	07	BEL	^G
08	08	BS	^H
09	09	HT	^I
10	0A	LF	^J
11	0B	VT	^K
12	0C	FF	^L
13	0D	CR	^M
14	0E	SO	^N
15	0F	SI	^O
16	10	DLE	^P
17	11	DC1	^Q
18	12	DC2	^R
19	13	DC3	^S
20	14	DC4	^T
21	15	NAK	^U
22	16	SYN	^V
23	17	ETB	^W
24	18	CAN	^X
25	19	EM	^Y
26	1A	SUB	^Z
27	1B	ESC	^[
28	1C	FS	^\
29	1D	GS	^]
30	1E	RS	^^
31	1F	US	^_

Dec	Hex	Ch
32	20	SP
33	21	!
34	22	“
35	23	#
36	24	$
37	25	%
38	26	&
39	27	'
40	28	(
41	29	)
42	2A	*
43	2B	+
44	2C	,
45	2D	-
46	2E	.
47	2F	/
48	30	0
49	31	1
50	32	2
51	33	3
52	34	4
53	35	5
54	36	6
55	37	7
56	38	8
57	39	9
58	3A	:
59	3B	;
60	3C	<
61	3D	=
62	3E	>
63	3F	?

Dec	Hex	Ch
64	40	@
65	41	A
66	42	B
67	43	C
68	44	D
69	45	E
70	46	F
71	47	G
72	48	H
73	49	I
74	4A	J
75	4B	K
76	4C	L
77	4D	M
78	4E	N
79	4F	O
80	50	P
81	51	Q
82	52	R
83	53	S
84	54	T
85	55	U
86	56	V
87	57	W
88	58	X
89	59	Y
90	5A	Z
91	5B	[
92	5C	\
93	5D	]
94	5E	^
95	5F	_

Dec	Hex	Ch
96	60	`
97	61	a
98	62	b
99	63	c
100	64	d
101	65	e
102	66	f
103	67	g
104	68	h
105	69	i
106	6A	j
107	6B	k
108	6C	l
109	6D	m
110	6E	n
111	6F	o
112	70	p
113	71	q
114	72	r
115	73	s
116	74	t
117	75	u
118	76	v
119	77	w
120	78	x
121	79	y
122	7A	z
123	7B	{
124	7C	|
125	7D	}
126	7E	~
127	7F	D

Communication Protocol Commands

Protocol Command (Mnemonic displayed on menu)	***Control Characters (Entered in menu or serial command)***	***Hex Code***	***Effect of Command***
RES	*^D*	*04*	*Reset*
REQ	*^E*	*05*	*Request*
EOT	*^D*	*04*	*Reset*
STX	*^B*	*02*	*Start of Text*
ETX	*^C*	*03*	*End of Text*
ACK	*^F*	*06*	*Acknowledge*
NAK	*^U*	*15*	*Negative Acknowledge*
XON	^Q	11	*Begin Transmission*
XOFF	^S	13	*Stop Transmission*

Appendix F — Defaulting/Saving/Resetting

Understanding and controlling your scanner's active, saved, and default settings is critical to the operation of your scanner.

<A>	Reset (does not save for power-on)
<Ard>	Reset and recall Microscan defaults
<Arp>	Reset and recall power-on parameters
<Arc>	Reset and recall customer default parameters
<Z>	Save current settings for power-on
<Zc>	Save current settings as customer default parameters
<Zrd>	Recall Microscan default parameters and save for power-on
<Zrc>	Recall customer default parameters and save for power-on

Power-on Parameters

Power-on parameters (saved by the **<Z>** command) are saved to NOVRAM and recalled and loaded into current parameters when power is cycled or the **<Arp>** command is issued.

Customer Default Parameters

Customer default parameters (saved by **<Zc>** command) are the same set of parameters as power-on but are saved in a different, isolated section of NOVRAM. This can allow a user to essentially create a backup set of parameters that can be recalled in the event that the current parameters or power-on parameters have been changed and no longer desired. It is important to note that a hardware default does not affect these parameters. For example, a user that inadvertently changed communication settings in power-on parameters in such a way that they either don't know the settings or don't have the capability to communicate at those settings. By using the hardware default to default the power-on settings to the known Microscan default, the user can then recall their previously customer saved settings with the **<Arc>** or **<Zrc>** commands.

Microscan Default Parameters

Microscan default parameters are contained in the firmware that cannot be changed.

Software Default

Microscan default parameters can be recalled (loaded into current settings) with **<Ard>** command or recalled and saved for power-on with the **<Zrd>** command.

Hardware Default

If a software default reset is not possible, it may be necessary to reset the scanner by shorting (connecting) specific pins. This procedure has the same effect as the **<Zrd>** software command.

Important: For this reset to occur, this command must be executed within 60 seconds after a power-on or a reset.

1. Apply power to the scanner.
2. Locate pins 7 and 11 on the host connector.

Caution: Be certain that the correct pins are located. Connecting the wrong pins could cause serious damage to the unit.

3. Momentarily connect these wires (or pins) and listen for a series of short beeps.
4. Within 3 seconds, connect them again. A longer beep should be heard. If not, repeat the process.

Default/Reset Definitions

Defaults are original or saved customer settings that can be recalled, either by software reset **<Zrd>** or hardware reset.

Also when in multidrop, defaulting might be required if the scanner has been assigned a polling address and you wish to access the scanner's menu.

Defaulting the scanner by **<Zrd>** resets the configuration parameters to Microscan default values. Defaulting might be necessary if you have make temporary changes, communications between the scanner and another device are lost or interrupted, or you are using incompatible equipment (for example, a terminal that is set at 38.4K baud communicating with a scanner that is set at 115.2K baud).[1]

Resets ("**A**" commands) affect only the current settings (active memory) and are not saved for power on or recall.

Active Memory is where the scanner's active settings are stored during use. These are not available on power-on unless saved by a "**Z**" command.

1. There are no menu options or host commands for resetting the configuration program.

Appendix G — Symbol Configuration

You can configure your scanner by presenting Code 128 symbols that the FIS-0003 Laser Scanner responds to as serial commands.

Note: Your scanner does not need to be enabled for Code 128 in order to enter symbol configuration.

Entering Symbol Configuration

The symbol used to enter configuration is the 7-character code 128 symbol shown below. It is not required that the scanner be configured to read code 128 symbols to read this start symbol or the following configuration symbols.

To setup for symbol configuration:

1. Put the scanner in a read cycle mode.
2. Place a special Code 128 configuration start symbol in the scanner's field of view.

   Use this symbol or one that you have created yourself.

   If the scanner is able to read the start symbol, it will begin to beep and the performance LEDs will be activated.
3. When the scanner starts to beep, remove the configuration symbol from the scanner's field of view.

   The beeping will end and the scanner will be in the configuration mode.

During the configuration mode the LEDs will emit a side-to-side pattern to let you know you are currently ready to configure.

You can create your own start symbol by encoding the following in Code 128:

FNC4 <_CFG>.

Using Configuration Symbols

Once in symbol configuration mode, serial command data encoded in Code 128 symbols is read by the scanner as serial input.

Configuration symbols must meet the following conditions:

1. The only valid configuration symbols are Code 128.
2. Symbol data may contain more than one command, but individual symbols must be presented one at a time. This is because only the first symbol in a read cycle record will be used as a possible configuration symbol.A symbol that is presented to the scanner must be read 25 times consecutively to be used as a valid symbol.

   Once this is done the scanner will interpret the symbol data in the same fashion as it interprets serial data.
3. Any valid command may be entered via symbols including operational commands.

   Because the data is treated like serial input multiple symbols may be used to represent one command as long as the symbols are presented individually and in the correct order.
4. Read rate command may also be used to enter read rate from symbol configuration mode.
5. When in read rate, the scanner will read the symbologies that were enabled prior to entering the configuration mode. However it will read a "**<J>**" in code 128 regardless of current enable/disable state of code 128.

   Once the **<J>** is issued the scanner exit both read rate and symbol configuration. To exit read rate and remain in symbol configuration, you present the start symbol once again. Symbols read in read rate will not configure the scanner.

To start a read rate test, scan this symbol:

Exiting Symbol Configuration

There are multiple ways of exiting symbol configuration. The first way is to simply read or serially enter the "**<J>**" command. Other ways include any command that executes a software reset. These commands include the save family as well as the reset family e.g. **<Z>**, **<Zc>**, **<Zrd>**, **<Zrc>**, **<A>**, **<Arc>** and **<Ard>**. When exiting symbol configuration with the symbol "**<J>**," the scanner will beep in response.

To end the read rate test and the symbol configuration program, scan this symbol:

This will terminate symbol configuration mode. Changes made in configuration will remain in effect just as would changes made in the menus or by serial commands. ***A-16***

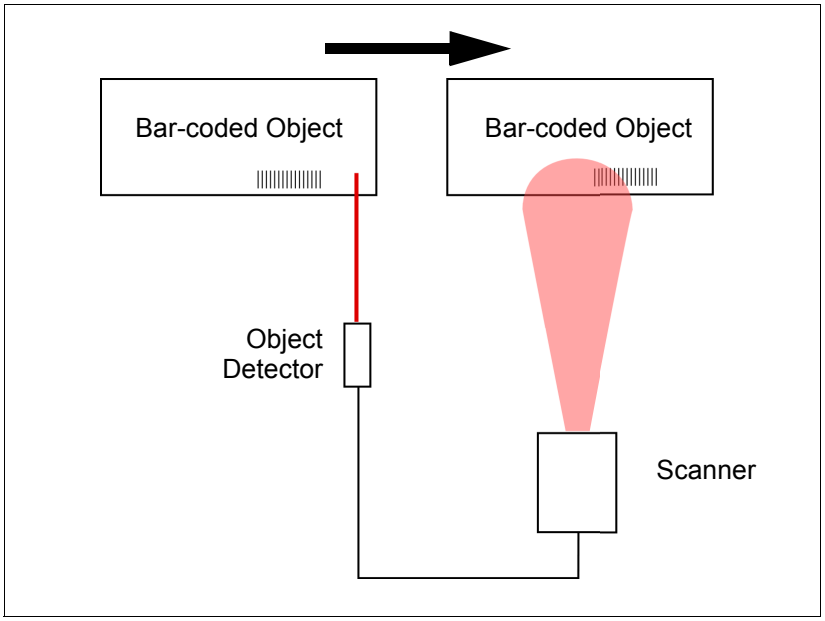
Appendix H — Object Detector

In a typical operation, a scanner will wait for symbol data only during a triggered read cycle. A read cycle is initiated by a “trigger” and can be in the form of a serial command from the host (internal trigger) or a signal from an object detector (external trigger).

When an object detector (also called a sensor, package detector, etc.) is used, it is set up so that its beam will bounce off the approaching object and the resulting pulse will be sent to the scanner to begin the read cycle. Typically, a detector is positioned so that it will detect the presence of an object before its symbol can be read.

An object detector is mounted in almost any position relative to the object as long as (1) the object passes within range of the detector and (2) direct or reflected light from the detector does not interfere with the scanner’s reception.

As the item continues to move down the line, its symbol moves into the scanner beam and is read by the scanner.



Object Detector

Appendix I — Formulas for Number of Decodes

To ensure reliable scanning, apply a minimum of *five* decodes to each symbol. Use the formulas below to calculate the number of decodes that your symbol will receive.

If the number of decodes you derive from one of these calculations is less than the minimum for your application, plug in the minimum number of decodes (5) and solve for another parameter that might be changed, such as scan speed or scans per second.

Note: While the formulas given here solve for the predicted number of decodes, you may also use the formulas to solve for other parameters that might be changed, such as scan speed, symbol length, etc.

Single Line Ladder Calculation

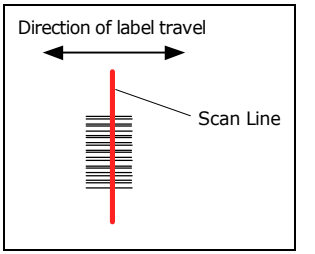
For single scan line ladder scanning, use the following formula:

$$\left(\frac{SH}{SS} \times DR\right) - 3 = ND \text{ (number of decodes)}$$ [1]

SH *(Symbol Height) (ladder formula only) is a measurement of the height of individual bars.*

SS *(Scan Speed) is the distance per second that a symbol moves through the scan.*

DR *(Decode Rate) is the number of decodes per second that a given symbol receives (as derived from a stationary scan test).*

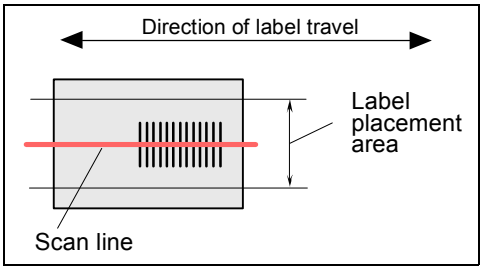


Ladder

Single Scan Line Picket Fence Calculation

For single scan line picket fence scanning use the following formula:

$$\left(\frac{(SW - SL)}{SS} \times DR\right) - 3 = \text{number of complete decodes}$$

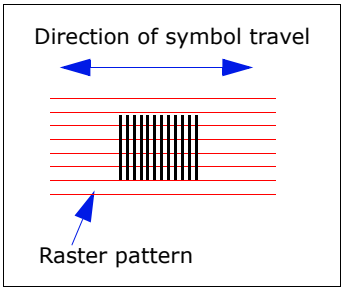


Picket Fence

1. The -3 component in the formula is included to allow for AGC acquisition, an incomplete first scan, and an incomplete last scan. This applies only if the number inside the parentheses equals 4 or more. If the number equals 3, then only subtract 2 to derive 1 good scan.

Raster Picket Fence Calculation

For raster picket fence scanning, the number of decodes (ND) that can be applied to a given symbol can be calculated once the sweep rate (SR) is known.



Raster Picket Fence

Sweep Rate (SR)

Sweep rate is the number of raster sweeps (up or down) that occur per second and can be set in **ESP**. Since the sweep rate cannot exceed 30 you first need to ensure that your application can achieve this by solving for sweep rate. The sweep rate should generally be set as low as possible in order to maximize the number of scans on a given symbol.

The formula for determining **Sweep Rate** (SR) is as follows:[1]

$$SR = \frac{2 \times SS}{(SW - SL)}$$

SR *= Sweep Rate, the number of passes, up or down, that are described by the arc of the raster mirror.*

SS *= Scan Speed, the distance per second that a symbol moves through the scan.*

SW *= Scan Width, the width across the scan beam, at a given distance from the scanner, in which a symbol can be read (picket fence formula only).*

SL *= Symbol Length, the length of the longest printed symbol to be read plus the length of the quiet zones (picket fence formula only).*

Example:

$SW = 5$

$SS = 2$ inches per second

$SL = 1$

$$SR = \frac{2 \times 2}{(5 - 1)} = 1$$

Important: The maximum sweep rate that your can set the scanner to is 80. If your solution is greater than 80, you must change another parameter such as scan speed, etc. and recalculate.

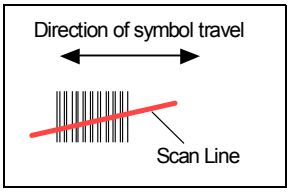
Since SR can only be entered into the software as whole numbers, round off fractions of SR to the next higher number, for example enter 0.4 as 1 and 3.5 as 4.

In setting up the scanner, raster height depends on the raster arc and the symbol distance (range) from the scanner. Both the top offset and bottom offsets can be adjusted independently in 255 increments and the resulting arc can vary from 0° to 30°.

1. The number 2 in the SR formula ensures that each symbol receives two full raster sweeps.

Angled Picket Fence Calculation

The number of complete scans for angled picket fence is calculated the same as that for picket fence, with the exception that the scan width is shortened in proportion to scan tilt.



Angled Picket Fence

Improving the Number of Decodes

After changing any of the parameters described in this section, recalculate the number of decodes.

Scan Speed

Scan speed is a function of motor speed and is adjustable. A slower scan speed may allow greater symbol range and/or higher decode rates, but at the cost of fewer scans per symbol. Applies to both picket fence and ladder oriented symbols. If your application allows it, slowing scan speed (the time in seconds that a symbol is fully within the scan width of the scanner) is an effective way to increase the number of decodes.

Range

Adjusting the symbol's range, if possible, is one of the quickest and most effective ways to improve decode rates. However, in some applications you may need to select a less than optimum range, or one that is beyond the fringes of the ranges.

Scan Width

Increasing scan width will increase the number of scans in a picket fence oriented application. Scan width is linked with scan range and changing one will usually require a change in the other.

Symbol Dimensions, Symbol Density, and Symbol Ratio

Not usually an option in most applications, but changes to symbol parameters can affect number of decodes calculations and possibly decode rates.

If your application allows it, shortening the length of a picket fence symbol means the symbol will be in the scan range longer and hence receive a greater number of scans. Increasing the height of a ladder symbol means it will receive more scans. Changing symbol density and/or symbol ratio is another way ranges, decode rates, etc. can be altered.

Appendix J — Operational Tips

Do:

- Check inputs (scan speed, length, height, etc.) to ensure the desired number of decodes per symbol.
- Connect scanner to host before connecting power to the scanner; disconnect power before disconnecting the host from the scanner.
- For optimum decodes, mount scanner so that your symbols pass through the center of the depth-of-field (minimum/maximum range). You find the center by moving your symbol in and out during a read rate test.
- Avoid excessive tilt, pitch, and skew of the symbol.
- Check the symbol for readability by doing a decode rate test. If there is any question about the symbol's readability, contact your Microscan representative.
- After changing any parameter that might affect decode rate, repeat decode rate test.
- Clean the scanner window with a clean, dry Q-tip or cotton cloth on a regular basis.

Do Not:

- Aim the scanner into direct light or sunlight.
- Aim the scanner into an external object detector or other light-emitting device.
- Obstruct the scanner window with mounting hardware or other objects.
- Connect chassis of scanner and host to different ground potentials.
- Operate the scanner in excessive temperature environments.

Appendix K — Interface Standards

Interface Standards, established by the Electronic Industries Association (EIA), specify such things as the signaling voltage levels, maximum cable lengths, and number of drivers. With Microscan devices, selection of interface is made by pin assignment and, in the case of the host communications, by software switching between RS232 and RS422. Microscan devices use RS232, RS422, and RS485 multidrop.

RS232

RS232 defines an interface between two devices, such as the scanner and host. It differs from the other interfaces by dedicating individual pins to specific functions and by requiring both devices to share a common ground line. Since both device chassis are connected to a common ground, a ground loop potential and the possibility of noise interference exists; therefore, cable lengths are limited to a maximum of 50 feet (19.7m). Despite being the most limited, this interface is used frequently because of the large installed base of RS232 equipment.

RS422

RS422, unlike RS232, measures signals deferentially; that is, the receiver looks at the potentials between the two receive (or transmit) wires rather than the potential between signal and ground. As a result, cables, if shielded, can be up to 4000 feet (1219m) in length. Like RS232, RS422 communication is designed for only two devices on a single line and must have a common ground. It can be used wherever RS232 is used.

RS485

RS485, like RS422, can transmit up to 4000 feet (1219 m) using differential voltages, but unlike RS422, its transmitters are turned off until a request for data is received from the host. RS485 is used exclusively in multidrop protocol.

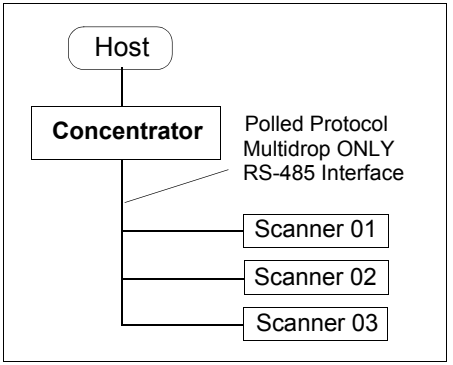
USB

The Universal Serial Bus can connect up to 127 devices to a host at a maximum of 6 megabits per second (Mbps) of bandwidth.

Appendix L — Multidrop Communications

This appendix describes the rules for setting up a concentrator or controller to communicate with a scanner in standard Multidrop protocol.

The diagram to the right shows a typical Multi-drop network in which 1 to 50 scanners can communicate with a host via an intermediary device, a concentrator or a controller.



Configure Your Scanner for Multidrop

1. With the scanner connected to the host, **Retrieve Reader Settings**.
2. Select **Multidrop** in the **Protocol** configuration menu.

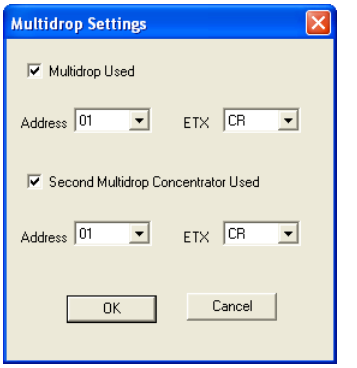
   You will see the following message:

   Important: *You must change your preamble and postamble characters so that they are not CR or NULL.*

   This allows data to move through the concentrator without interference.
3. Click **OK**.
4. Next, go to **Preamble Characters** (still in the **Protocol** menu) and double-click on **Characters**.
5. This will open up an ASCII character table. Select any character other than **CR**. For example, select **LF**.
6. Repeat the above for **Postamble**.
7. Check the multidrop address. Enter a number from **01** to **50**.
8. Right-click in the window and select **Save to Reader** and **Send and Save**.
9. Your scanner is now in multidrop. From here on, you will need to use the concentrator to relay commands and data between the scanner or scanners and the host.
10. Next, go to **"Connect to Reader via the Concentrator"** on the next page.

Connect to Reader via the Concentrator

You will need a multidrop concentrator and the required power supplies and cabling to communicate with your scanner(s).



1. From the **Communications** drop down menu, select **Configure Multidrop** to bring up the **Multidrop Settings** dialog.
2. If necessary, change the default address to match the address of your multidropped scanner and click **OK**.

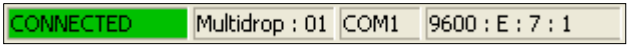
   If the host serial port is not connected in **ESP**, you will see the following popup message:

   ***ESP** is not currently connected to the multidrop concentrator. Do you wish to establish a connection now?*
3. Click **Yes**.

   You will see a **Serial Communication Parameters** dialog.

   Notice that the **Force Connection** option is checked. Do not change this.
4. Select the concentrator's host port communications settings.

   When you click **Connect**, you will be connecting to your concentrator, which can then relay commands to the scanner whose address was set in the **Multidrop Settings** dialog.
5. Click **Connect**.
6. You should see the **CONNECTED** message in green at the bottom of the window along with the scanner's **Multidrop** address.

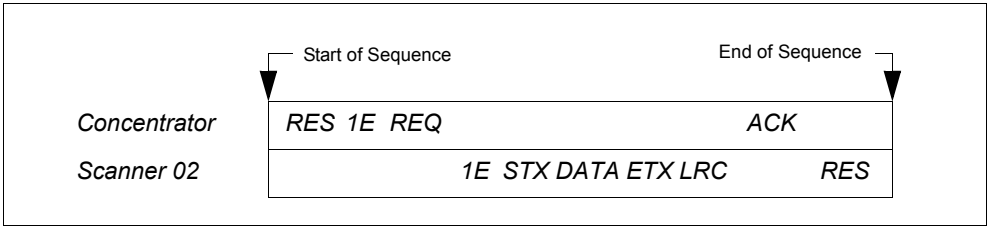
7. Click **Retrieve Reader Settings** to upload scanner's configuration. If upload fails, return to the **Serial Communication Parameters** dialog and make the necessary corrections.
8. Follow the same procedure for connecting other scanners to your multidrop network.

Polling Sequence

Data that is transmitted to the host (symbol data, noread messages, counters, etc.) via concentrators is solicited by poll requests from the host.

The polling sequence example is by poll address 1E (ASCII hex value for Scanner 02) and a REQ (request). The scanner responds by first transmitting its own address, 1E, followed by a STX (start of text) character, and then the data. Next it transmits an ETX (end of text) character and an LRC (longitudinal redundancy check) character.

If the concentrator (or controller) receives the data from the scanner and is able to validate it with an LRC calculation, it responds with an ACK (acknowledgment). If the scanner in turn receives the ACK, the scanner ends this exchange with a RES (reset).



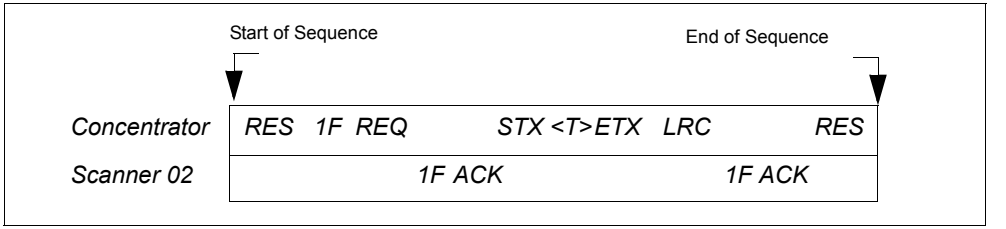
Polling Sequence

Polling Reset

- If the scanner has no information, it responds to a poll request by transmitting a RES (reset).
- If the scanner receives a NAK instead of the ACK after transmitting its data string, it will re-attempt to send the data string up to three times. If the scanner still does not receive an ACK, it will send a RES (reset) and discard the data in its buffers.
- If the scanner transmits data to the concentrator and the concentrator responds with an ACK or NAK, but the scanner doesn't receive the concentrator's response, the scanner will timeout and send a REQ to the concentrator and request another response. If after three retries (the number of times it transmits a REQ to the concentrator) the scanner receives no response, it ends the transmission with a RES (reset).

Select Sequence

Unlike poll requests, select commands always originate from the host and consist of serial configuration or operation commands to devices that are configured in Multidrop. The scanner complies with the command when it is polled during the cycle.



Polling Sequence

A RES (reset) is the first command in the select sequence. The 1F hex is the select address associated with Scanner 02 address. It is followed by a REQ (request). The scanner responds with its own select address, 1F hex, and an ACK (acknowledge). The concentrator then transmits an STX (start of text), the data (in this case a **<T>**), an ETX (end of text), and an LRC character.

The scanner replies by transmitting its own address, followed by an ACK, acknowledging receipt of the command. Upon receipt of an ACK, the concentrator concludes the successful exchange with a RES.

In the example above, the scanner only acknowledges a trigger counter request from the concentrator. It does not respond to the trigger counter request until a subsequent poll. For example, if the scanner's trigger count was 12 at the time the trigger counter request was received, on a subsequent poll it would send 02T/00012. (The 02 at the beginning of the string is the scanner's address.)

Select Reset

If the scanner receives bad data from the concentrator, it transmits a SEL (its select address) and a NAK to the concentrator. The concentrator re-transmits the data up to three times. The concentrator will end the sequence with a RES (reset) if no ACK is received.

Multidrop Addresses

Multidrop Address	Poll Character		Select Character	
	ASCII	HEX	ASCII	HEX
01	^\	1C	^]	1D
02	^^	1E	^-	1F
03	SP	20	!	21
04	"	22	#	23
05	$	24	%	25
06	&	26	'	27

Multidrop Address	Poll Character		Select Character	
	ASCII	HEX	ASCII	HEX
26	N	4E	O	4F
27	P	50	Q	51
28	R	52	S	53
29	T	54	U	55
30	V	56	W	57
31	X	58	Y	59

07	(	28	)	29
08	*	2A	+	2B
09	,	2C	-	2D
10	.	2E	/	2F
11	0	30	1	31
12	2	32	3	33
13	4	34	5	35
14	6	36	7	37
15	8	38	9	39
16	:	3A	;	3B
17	<	3C	=	3D
18	>	3E	?	3F
19	@	40	A	41
20	B	42	C	43
21	D	44	E	45
22	F	46	G	47
23	H	48	I	49
24	J	4A	K	4B
25	L	4C	M	4D

32	Z	5A	[	5B
33	\	5C	]	5D
34	^	5E	_	5F
35	`	60	a	61
36	b	62	c	63
37	d	64	e	65
38	f	66	g	67
39	h	68	i	69
40	j	6A	k	6B
41	l	6C	m	6D
42	n	6E	o	6F
43	p	70	q	71
44	r	72	s	73
45	t	74	u	75
46	v	76	w	77
47	x	78	y	79
48	z	7A	{	7B
49	|	7C	}	7D
50	~	7E	D	7F

Appendix M — Troubleshooting

Symptom	Cause	Solution
Motor won't spin up and scan.	Power supply is lower than required voltage.	Use a shorter cable or provide required input voltage.
	Default pin held low at power-up. **Boot mode** enabled.	Bad cable. Fix or replace cable.
	Missing or faulty Application Code; **Boot mode** enabled.	Enter **boot mode** with power-up and **default** pin. Download new Application Code.
LEDs are flashing but MS-3 is not scanning.	**Boot mode** enabled.	Verify Application Code. Release **default** line and re-power unit.
MS-3 is not decoding.	The symbology being used in the application is not enabled in the scanner.	Enable the symbology type being used in the application.
	Length field does not match actual length.	Disable fixed length option or change length field to match actual symbol length.
Poor decode performance.	High frequency ambient lighting.	Shade bar code read area, especially the scan path between the unit and the bar code.
	Poor bar code printing, ratio errors, or erroneous bar widths.	Try **aggressive ratios**. (**Tight ratios** decode high-quality symbols. **Standard ratios** decode most symbols. **Aggressive ratios** are loosened to allow decoding of poor quality symbols. See **Symbol Ratio Mode** for more information.) Improve bar code print quality.
	Symbol is not in the focal area of laser.	Re-position symbol or scanner for optimal focus position.
	Excessive curvature of symbol.	Try **aggressive ratios**. (**Tight ratios** decode high-quality symbols. **Standard ratios** decode most symbols. **Aggressive ratios** are loosened to allow decoding of poor quality symbols. See **Symbol Ratio Mode** for more information.)
	Gain value not optimal.	Try **autocalibration**.
	Other objects in field of view are misleading the **gain control** system.	Try to eliminate shiny objects from the field of view.
	Scan rate is too fast, exceeding MS-3's video bandwidth.	Slow down the scan rate.
	Quiet zone not large enough.	Do not violate the 10x rule for quiet zone; enable narrow quiet zone setting.
	Contaminants on window.	Clean window with non-abrasive cleaner and wiping cloth; refer to the User Manual for cleaning instructions.
Reads well with static bar codes, but once bar codes are in motion there are many No Reads.	A preceding bright object is increasing recovery time for **gain control**.	Remove shiny objects that may enter the scanner's field of view before the symbol enters the field of view. Try fixed **gain**.
	Specular reflection preventing AGC stability.	Remove shiny objects that may enter the scanner's field of view before the symbol enters the field of view. Try fixed **gain**.
Different segments of bar code decode 100%; others decode 0%.	Poor printing, ratio errors, or erroneous bar widths.	Try **aggressive ratios**. (**Tight ratios** decode high-quality symbols. **Standard ratios** decode most symbols. **Aggressive ratios** are loosened to allow decoding of poor quality symbols. See **Symbol Ratio Mode** for more information.) Correct printing variations and improve bar code print quality.
Cannot communicate with MS-3.	MS-3 has **defaulted** settings. No longer set to user communication settings.	Connect using **default** settings instead of user settings.
	Unit is in **boot mode** and communication settings are not the same as **application mode**.	Set communication parameters to 57.6K, 8, 1, None. Exit **boot mode**.

Decode performance was good but is now bad.	Laser failing.	Return for service.
	Motor failing.	Return for service.
	Focus shifted.	Re-position scanner or symbol. If re-positioning does not help, return for service.
	Symbology has changed, or there are differences in printing or bar width.	Try **aggressive ratios**. (**Tight ratios** decode high-quality symbols. **Standard ratios** decode most symbols. **Aggressive ratios** are loosened to allow decoding of poor quality symbols. See **Symbol Ratio Mode** for more information.) Improve bar code print quality.
	Symbol position has moved from initial testing position.	Re-position scanner or symbol.

MS-3 LED Indicators

LEDs	Normal Read Modes	Normal Read Modes	Normal Read Modes	Read Test Mode	Read Test Mode	Read Test Mode	Read Test Mode	Read Test Mode	Read Test Mode	Control Mode	Control Mode	Control Mode	Boot Mode	
100%	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	BLINK	ON	OFF
80%	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	BLINK	OFF
60%	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	BLINK	OFF
40%	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	BLINK	OFF
20%	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF
PWR	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF
	Unit has not run a read cycle yet or did run a read cycle but did not have a Good Read result.	Unit is in an active read mode.	Unit is idle; last read cycke was a Good Read.	0% <Cp> or <C> the % of scans to decodes is presented as a percentage and shown by the LEDs.	1% - 20% <Cp> or <C> the % of scans to decodes is presented as a percentage and shown by the LEDs.	21% - 40% <Cp> or <C> the % of scans to decodes is presented as a percentage and shown by the LEDs.	41% - 60% <Cp> or <C> the % of scans to decodes is presented as a percentage and shown by the LEDs.	61% - 80% <Cp> or <C> the % of scans to decodes is presented as a percentage and shown by the LEDs.	81% - 100% <Cp> or <C> the % of scans to decodes is presented as a percentage and shown by the LEDs.	In the onboard menu system.	In ESP Mode.	In ESP Mode getting digital bar code scan.	In Boot Mode or In Boot Mode and downloading firmware.	No power.

Appendix N — Glossary of Terms

AGC — See **Automatic Gain Control**.

Analog — A smooth, continuous voltage or current signal or function whose magnitude (value) is the information.

Automatic Gain Control (AGC) — Adjustment to signal strength that seeks to maintain a constant level regardless of the distance between a scanner and symbol.

Baud Rate — The number of discrete signal events per second; bits per second.

Check Character — A Modulus 43 or Modulus 10 character that is added to encoded symbol data for additional data integrity.

Connector — A plug or socket on a device or cable providing in/out connectivity for various circuits and pins.

Concentrator — Intermediary device that relays data from scanners to a host and commands from the host to the scanners or other devices.

Counter — Memory space allocated to keep track of scanner events.

Daisy Chain — Linkage of primary and secondary scanners allowing data to be sent to the host.

Decode — A good read. The successful interpretation and output of the information encoded in a symbol.

Default — Restores non-volatile or flash memory settings, initializes serial commands, and resets all counters.

Delimited — A delimited command or field is bracketed by predefined characters.

Decode Rate — The number of good reads per second ahieved by a scanner.

Discrete I/O — Inputs and outputs characterized by discrete signal transitions from one voltage level to another so that digital switching can occur.

End of Read Cycle — The time or condition at which the scanner stops expecting symbol information to decode.

External Edge — Allows a read cycle to be initiated by a trigger signal from an object detector when it detects the appearance of an object. The read cycle ends with a good read, a timeout, or a new trigger.

External Level — Allows a read cycle to be initiated by a trigger signal from a photo sensor. The read cycle ends when the object moves out of the detector's range.

Firmware — Software hard-coded in non-volatile memory and closely tied to specific pieces of hardware.

Fixed Symbol Length — Increases data integrity by ensuring that only one symbol length will be accepted.

Full Duplex — A communication system in which signals can travel simultaneously between devices.

Gain — Optimal signal strength.

Good Read — A decode. The successful scanning and decoding of the information encoded in a symbol.

Half Duplex — A communication system in which signals can travel between devices in both directions, but not simultaneously.

Host — A computer, PLC, or other device that is used to execute commands and process data and discrete signals.

Initialize — Implement serial configuration commands into the scanner's active memory.

Input — A channel or communication line. Decoded data or a discrete signal that is received by a device.

Ladder Orientation — A linear symbol orientation in which the bars are parallel to the symbol's direction of travel.

LED — See **Light-Emitting Diode**.

Light-Emitting Diode (LED) — A semiconductor device that emits light when conducting current.

Multidrop — A communication protocol for networking two or more scanners or other devices with a concentrator (or controller) and characterized by the use of individual device addresses and the RS-485 standard.

Noise — The same as static in a phone line or "snow" in a television picture, noise is any unwanted electrical signal that interferes with the symbol data being decoded and transmitted by the scanner.

Normally Closed — A discrete output state that is only active when open.

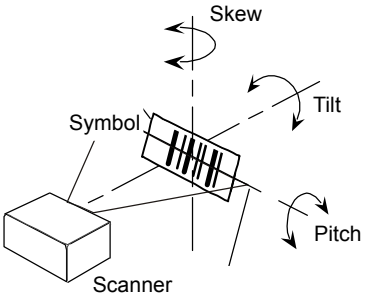
Normally Open — A discrete output state that is only active when closed.

Output — A channel or communication line. Data or discrete signals that are transmitted or displayed by a device.

Parity — An error detection routine in which one data bit in each character is set to 1 or 0 so that the total number of 1 bits in the data field is even or odd.

Picket Fence Orientation — A linear symbol orientation in which the bars are perpendicular to the symbol's direction of travel.

Pitch — Rotation of a symbol around an axis parallel to the symbol length on the substrate. See the illustration below.



PLC — See **Programmable Logic Controller**.

Port — Logical circuit for data entry and exit. (One or more ports may be included within a single connector.)

Programmable Logic Controller (PLC) — An electronic device used in industrial automation environments such as factory assembly lines and automotive manufacturing facilities.

Protocol — The rules for communication between devices, providing a means to control the orderly flow of information between linked devices.

Read Cycle — A programmed period of time or condition during which a scanner will accept symbol input.

Skew — Rotation of a symbol around an axis parallel to the symbol height on the substrate. See the illustration under the definition of **Pitch**.

Substrate — The surface upon which a symbol is printed, stamped, or etched.

Symbol Transitions — The transition of bars and spaces on a symbol, used to detect the presence of a symbol on an object.

Symbology — A symbol type, such as Code 39 or Code 128, with special rules to define the widths and positions of bars and spaces to represent specific numeric or alphanumeric information.

Tilt — Rotation of a symbol around an axis perpendicular to the substrate. See the illustration under the definition of **Pitch**.

Trigger — A signal, transition, or character string that initiates a read cycle.

Very Large-Scale Integration (VLSI) — The creation of integrated circuits by combining thousands of transistor-based circuits on a single chip.

VLSI — See **Very Large-Scale Integration**.